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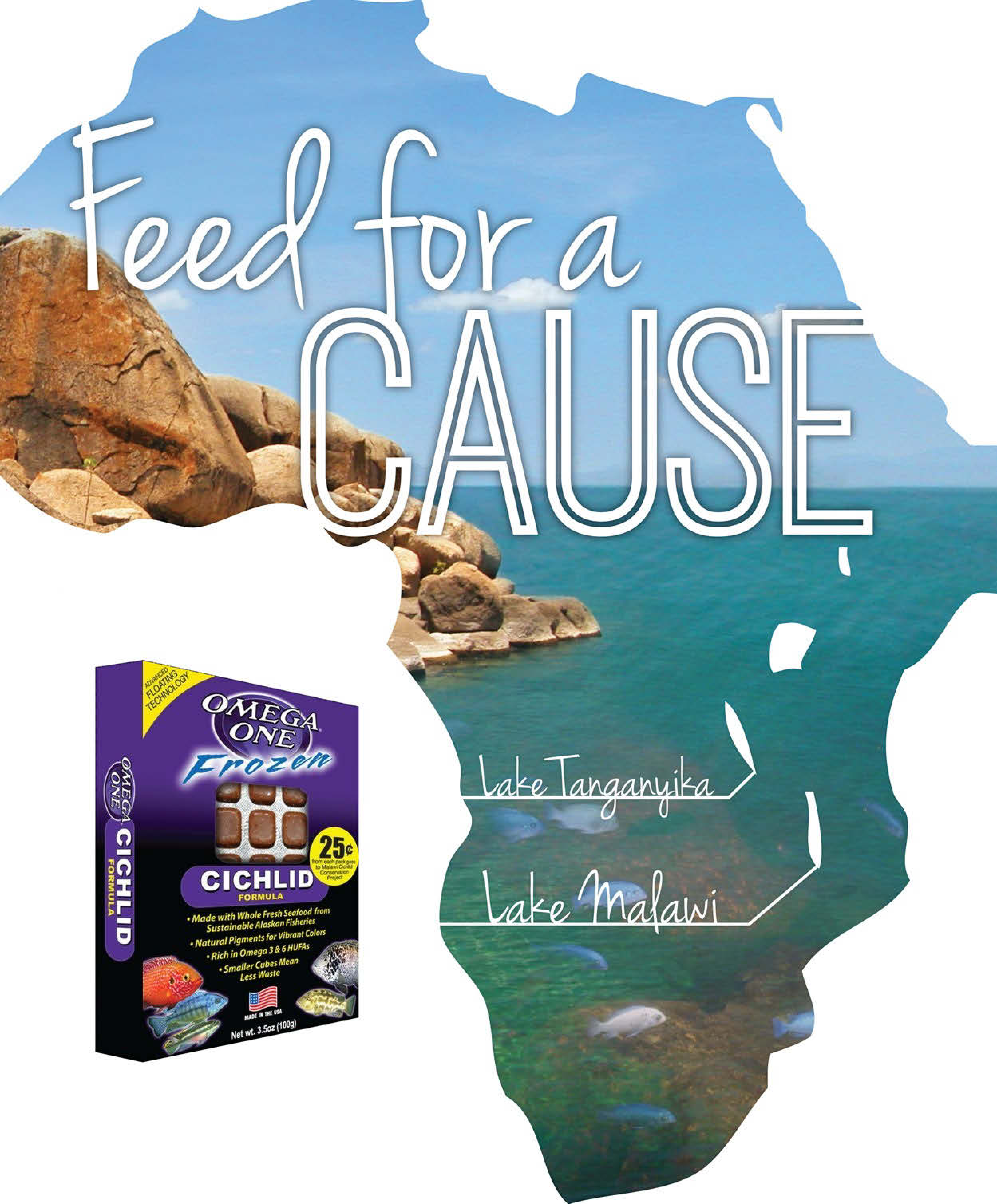
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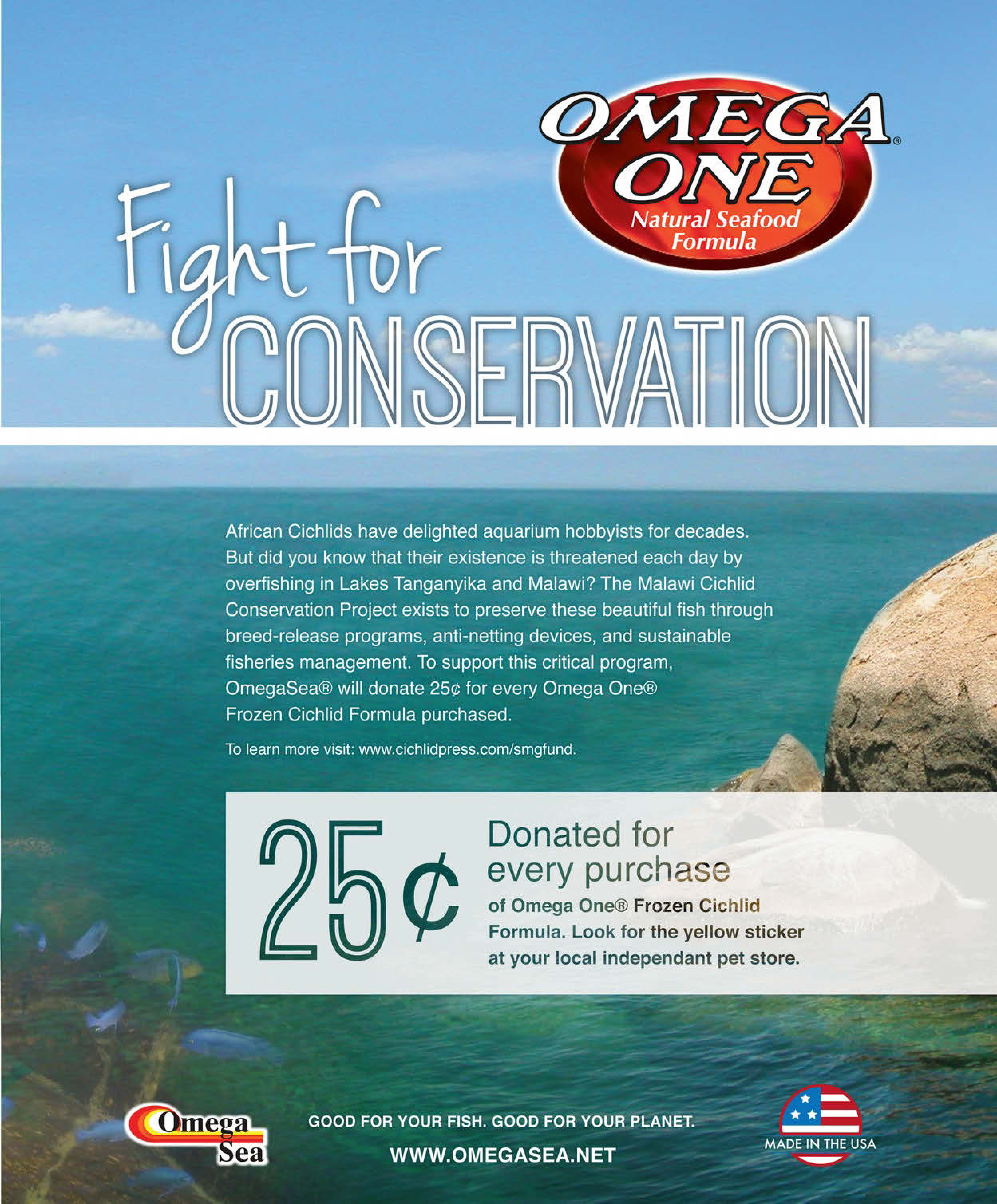

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cover

Exploding with vibrant color on this month's cover is a branching coral of the genus *Euphyllia*, which includes the ever-popular frogspawn, hammer, and torch corals. In the aquarium *Euphyllia* corals can thrive in moderate lighting and a gentle current, and they accept feedings with relative gusto. Members of this genus are known to deploy long, stinging sweeper tentacles at night, however, so it's best to leave some room between them and neighboring corals.

Photograph by Tyler Fox/Shutterstock

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executive editor: Glen S. Axelrod

publisher: Albert Connelly, Jr.

associate publisher: Stephanie Fornino

Editorial & Design

senior consulting editor: Neal Pronek

editor: Glenn Polyn

art director: Alexander Appello

editor emeritus: Warren E. Burgess, PhD

contributing editors: James Fatherree, MSc, Bob Fenner, Richard Stratton, Jack Wattley, Amanda Wenger, Claudia Dickinson, Mark Denaro, Charles Clapsaddle, Shari Horowitz, Jeremy Gosnell, Ted Judy, Joshua Wiegert, Leah Maddocks, Ellen Bingham

Advertising

advertising sales manager: Raquel Mayfield-Bradford

Subscriptions

circulation manager: James Craven

customersupport@tfh.com
1-888-859-9034

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president/chief executive officer: Glen S. Axelrod

executive vice president: Mark E. Johnson

vice president, creative direction: Nancy S. Rivadeneira

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publisher's note

Debbie Connelly

On April 18–19 the 8th annual Marine Aquarium Expo (MAX) comes roaring back to the Orange County Fair & Event Center in beautiful Costa Mesa, California, where thousands of marine and reef aquarium hobbyists and industry professionals will come together for a weekend of fun, friends, and plenty of cool fish and corals. And once again this year, *TFH* is proud to be the Official Magazine of MAX, an honor that recognizes our support of this always-spectacular annual event. Boasting more than 100 exhibitors, workshops, and speakers, MAX is an all-inclusive extravaganza for adults and kids alike, with something for everyone—even mermaids, who will be among the event staff.

Kids will enjoy fun features like MAX's 8-foot (2.5-meter) touch tank, where both the young and the young-at-heart can walk up to and interact with sea creatures like (sting-less) stingrays, starfish, hermit crabs, snails, shrimp, horseshoe crabs, corals, sponges, and more. And adult visitors—as well as kids with the reefkeeping bug—will get to see the newest innovations in equipment and techniques, as well as the hottest new livestock, including fish, inverts, and coral frags of every kind for trade and sale. There's so much to enjoy at the Marine Aquarium Expo—read all about it in this issue's "Aquarium Society News" (p. 90), and if you can make the trip, come join us at MAX 2015!

And speaking of coral frags, as part of our marine coverage in celebration of MAX 2015, be sure to check out Richard Aspinall's third and final installment in his series on coral fragging, "A Guide to Fragging, Part 3: SPS Corals" (p. 84), and learn his step-by-step techniques for fragging the ever-popular small-polyped stony corals, such as the *Acropora* he uses this month to demonstrate his method. Also on the saline side of this issue's coverage, staying for a moment on the topic of stony corals, this issue features an excerpt from the TFH/Microcosm book *Aquarium Corals* by Eric Borneman, a section of the chapter on stony corals featuring a look at the open brain, elegance, hammer, and torch corals, with notes on their natural history and proper keeping (p. 70).

And for a look at corals and fish in their native habitats, this month we embark on a snorkeling trip to Cuba's Playa Pesquero and Guardalavaca with the intrepid John Robertson, where he observed a host of reef life including wrasses, scorpionfish, an otherworldly flying gurnard, and a group of pugnacious damsels (p. 78). And as if that's not enough, this issue also features an informative look from "The Salt Mix" columnist James Fatherree at two members of the tang family Acanthuridae, the Atlantic blue tang and the ocean surgeonfish (p. 38), and our traveling public aquarium aficionado Iggy Tavares checks in from the other side of the world with a walking tour of the Shanghai Ocean Aquarium (p. 64).

Naturally, our coverage doesn't stop there, as we have plenty for freshwater fans to love too, including a deep dive into the world of electric fishes, like the odd and incredible ghost knifefishes (p. 48), a look at some popular aquatic plants from Africa and Madagascar in Amanda Wenger's "The Planted Tank" (p. 22), and a survey of awesome new imports from Oliver Lucanus's "Import Report" (p. 34). Longtime readers will also be happy to see the return of *TFH*'s own Gary Elson, filling in this month as our guest "Life with Livebearers" columnist with the story of his challenges and eventual success with the ginger ale livebearer (p. 26). Also this month, Mark Denaro examines the care and keeping of the rare and wonderful *Betta rubra* (p. 30), and Ted Judy's "Cichlid World" takes a look at the tiny Tanganyikans of the genus *Julidochromis* (p. 18).

Of course, there's even more to see this month in everyone's favorite aquarium magazine—dive right in!

A. J. C

Albert J. Connelly, Jr.
Publisher
Tropical Fish Hobbyist

Facebook Poll: What species of fish has lived the longest in your home aquarium and for how many years?

Red-belly pacu, 32 years old.
Les Konopka

Betta, an amazing 11 years. Pretty good for such a short-lived fish.
Rachel Ellis

Two Raphael catfish, 26+ years old, and a *Synodontis decorus*, 25+ years old, all still going strong.
Samantha Babb

Giant gourami, 11 years.
Alvin Tay

Bichir, 16 years and counting.
Steve Stivers

I have a *Synodontis angelicus* that is 23 years old and counting. She eats right out of my hand.
Heidi Kleiber

Iridescent shark, 16 years and counting.
Kristen W.

Polypterus retropinnis for 17 years.
Carl T. Olszewski

Red-tail shark, 12 years.
Chuck Davis

Flying fox, 11 years.
Anthony Lordigyan

Female *Ancistrus*, 15 years and counting.
Jonas Anderson Blichfeldt

A pleco that I bought over 35 years ago!
Joseph Gregor

Yellow tang, 15+ years.
Lauren Lucas

A bristlenose who is 9 years old and named Spud.
Karina Hobdell

My mum's goldfish, 43 years, and my silver dollars, 16 years.
Emily Price

Arowana, 15 years until he jumped out one day when I forgot to put the cinder blocks back on top of the tank cover after doing a water change.
Arnold Lester

Oscar, 13 years, big pig.
Joe Martin

Blood orange parrot cichlid, 12 years.
John Kalinowski

Clown loach, 21 years and still going strong.
David Talbot

Buttikoferi, 12 years.
Ram V. Agarb

I had a silver dollar for almost 6 years.
Christopher Rinch

Clown plecos, going on 11 years. My friend has a cory cat that is 17.
Erinn Duprey

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from the mind of Jack Kent

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Jack Kent

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Q&A freshwater

Q Filter for Angelfish Fry

I have baby angels that are not yet free-swimming. Is it better to have a sponge filter or a hang-on-the-back power filter? The tank is approximately 40 gallons (151 liters), and there are no other fish.

Wendy McNall
via Facebook

A *A sponge filter will be a better choice. Newly free-swimming angelfish fry will form a swarm around the parents and will be susceptible to being moved by currents in the tank and sucked into a power filter intake. A sponge filter will create a more gentle current and will not be strong enough to trap the fry against the sponge. The sponge will also be a source of microorganisms for the fry to eat.*

Q Rotting Fins

My betta is lethargic and its fins are rotting away. I keep it in a 2-gallon (7.5-liter) unfiltered betta bowl.

Mary Ann Griffiths
via Facebook

A Betta splendens *are hardy fish, but they are as susceptible to stress as any other fish. There are two common reasons that a betta's fins will rot away. True fin rot is a bacterial disease that will manifest as a slimy white film on the fins and other parts of the body. This disease will need to be treated with antibiotics.*

A more common cause of degenerating fins in a betta is poor water quality. High ammonia, nitrite, and nitrate contents will cause the fins to deteriorate and prolong healing. Poor water quality can also cause listlessness. Water temperature will also play a part.

A 2-gallon (7.5-liter) betta bowl is hard to keep consistently warm, especially in the colder times of year. You can solve water-quality problems by doing regular 50-percent water changes each week and keeping the bowl someplace where the temperature is consistently over 70°F (22°C).

Q Fasting Period for Fish?

Do you recommend fasting your fish once a week? We have a hard time doing this when our fish come up to the tank front begging for food. They seem to enjoy being fed every day.

Sid and Sharon
via email

A *There is no one-size-fits-all answer to a question about forcing a fasting period on fish, because fasting can affect different fish in different ways—just as there will be different response to the fast from some fish than from others.*

got a question?

Send your questions about the freshwater side of the aquarium hobby to "Q&A," T.F.H. Publications, P.O. Box 427, Neptune, NJ 07754, or submit via email to editor@tfh.com. For answers to more time-sensitive questions, opinions on your setup, or just to converse with like-minded members of the aquarium community, please visit the *TFH* Forum at forums.tfhmagazine.com.

In general, since fish are cold-blooded organisms and do not burn energy just to stay alive, there is little harm in a healthy fish missing a meal. The length of time a fish can go without food depends upon several factors, including the general health of the fish, its body size, age, type of food it requires, and how its digestive system works.

A large adult fish with a lot of body mass can go longer without food than a newly free-swimming fry with almost no body mass or energy reserves. A predator species is designed to go long periods between meals and to be able to eat large portions at one time. A plant or algae eater usually feeds 90 percent of the time that it is active and requires more food on a regular basis.

There is also the behavioral response to fasting to consider. A large omnivore species that does not chase danios when it is well fed may decide to eat the small fish when food becomes scarce for too long.

Fasting one's fish is a choice. There is little evidence either way to suggest that fasting is helpful or not. However, overfeeding prior to a vacation or period of time away from the aquarium is much more damaging than making the fish live a few days without food.

Ted Judy

The long fins of fancy *Betta splendens* strains are highly susceptible to bacterial infection in dirty water.

Ted Judy

Small fish, like these celestial pearl danios (*Danio margaritatus*), do not have the energy reserves that large fish possess and cannot survive many days without food.

Q Killer Water Changes

I have an aquarium that has been set up for about six months. I do water changes every other week, but when I do them, a fish almost always dies. It seems that smaller water changes are less stressful. If I do more than a 20-percent water change, the fish suffer (and a 50-percent water change is a sure killer). If a fish dies, it happens in a few hours, but by the next day, everything is fine. What is going on?

Mark Miller
via email

A *The most likely cause is a chemical that is going into the aquarium with the new water during the water change. It is a chemical that is stressful in small amounts but a killer in larger concentrations. This is a chemical that is toxic at first but will lose its toxicity over a few hours.*

That describes chloramine, a compound of chlorine and ammonia that is used by some cities in place of just chlorine. Chloramine is not removed from water as easily as chlorine is, and it behaves just like ammonia in the water. A small amount is stressful, but larger amounts will kill. Your aquarium's nitrogen cycle will remove chloramine, just as it does ammonia.

Check with your local aquarium store to see whether chloramines are used in your area, or contact your water utility. There are water conditioners designed to neutralize chloramine.

Q Something in the Sand

I have a tank with an oscar cichlid and a catfish. The sand on the bottom keeps turning black in one area of the tank. What is happening, and is it something that I should worry about?

Dan Shackleton
via Facebook

A *Sand as a substrate has its pros and cons. The advantages of sand are that it is a very natural bottom, does not collect a lot of detritus between its grains, and is inexpensive. The cons are that sand is hard to keep clean, can be difficult to grow plants in, and can potentially compact and form pockets of anaerobic bacterial colonies.*

The latter is what you have happening. Yes, you should be worried about it. The keys to maintaining a sand substrate are to keep it shallow and moving. Deep sand that sits and stagnates is more likely to form anaerobic pockets. Using a substrate vacuum to turn the sand over during water changes will eliminate the problem and keep it from coming back but only if the water changes are done frequently (at least every few weeks).

Ted Judy

Corydoras reticulatus and other species of sand-sifting fish can help to keep sand substrates clean.

*The longer the time between water changes, the thinner the layer of sand should be. Adding fish that will turn the sand over for you is a good idea, and they are fun to watch too. Eartheater cichlids (*Geophagus *spp.) and armored catfish (*Corydoras *or* Brochis *spp.) are very good at sweeping dirt out of sand.*

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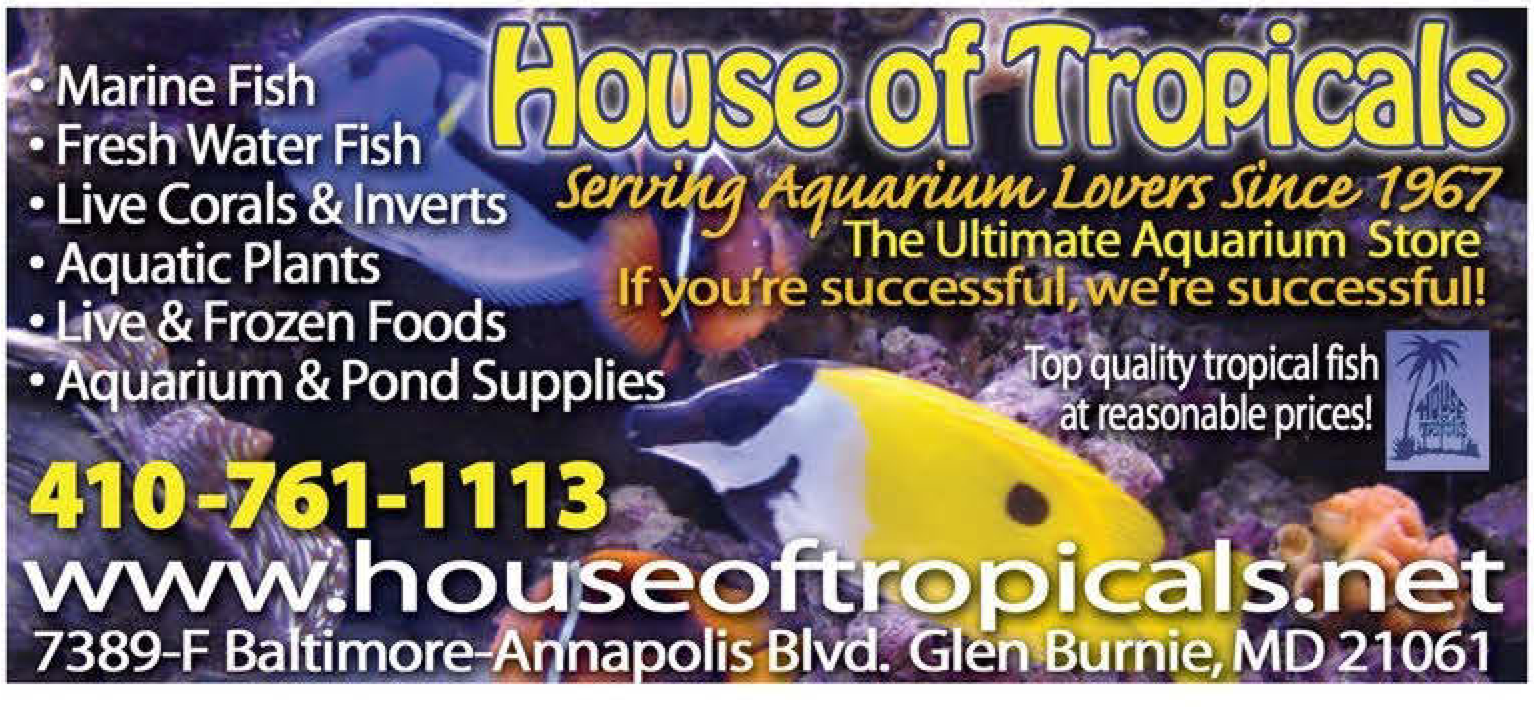

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Farm-Raised Florida Flagfish

Q I am having problems keeping Florida flagfish (*Jordanella floridae*) alive. I have had two of them, and both have died with no real symptoms. They just got thinner and thinner, even though they had plenty of different types of algae to eat, along with a varied diet of frozen, freeze-dried, and flake food. What is causing these fish to die?

James Licato
via email

A *Florida flagfish are killifish found naturally in freshwater habitats on the Florida peninsula. Sometimes they are also found in brackish-water estuaries, but they are much more closely associated with fresh water. The fish are similar to pupfish (*Cyprinodon *spp.) in appearance but are actually quite different. Most of the Florida flagfish are produced commercially in ponds on fish farms.*

The problem you are describing indicates that the fish may be arriving in your aquarium with internal parasites that are making it difficult for the fish to digest food. These parasites are not uncommon in pond-raised fish, where thousands of the same species are raised together, making it easy for the parasites to pass from one host to another.

Sometimes these pests are not a problem until the host fish is subjected to stress, at which point the fish's immune system is compromised and the parasites can increase in number to the point that they harm the fish. The process of collecting, quarantining, and shipping can be very stressful, and the food items you are offering will be different from what the fish are used to. All of this adds up to the stress that can cause a parasite infestation to become deadly.

There are several medications that target internal parasites in fish. They are best administered in a quarantine tank before a fish is added to the community aquarium. Keeping a fish in quarantine for a few weeks should help you to see problems and treat them before they kill the fish and before you add a problem to your display tank.

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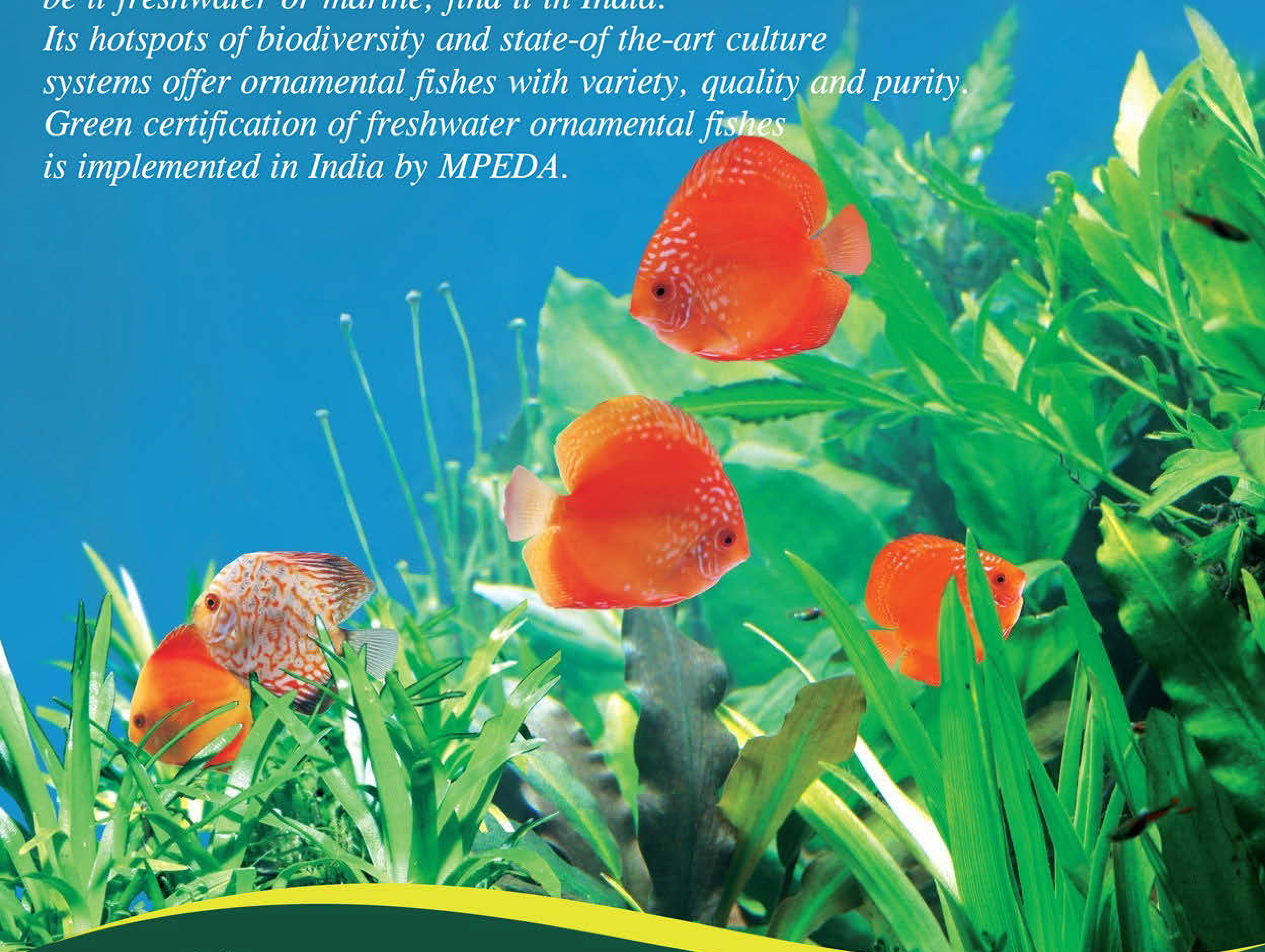

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Q&A saltwater

Avoiding Snags with Frags

Q Is a frag tank necessary? I want to start propagating corals for trade with fellow hobbyists, but I wonder if it's possible to simply use frag racks in my large reef tank? What does setting up a frag tank entail?

Leslie Hakanson
Yorkville, Illinois

A *The necessity of a frag tank depends largely on your goals as an aquarist. If you want frag trades to be your primary source of new livestock, then a frag tank would be needed. You can grow coral frags in a large reef tank, but there are many considerations. Sometimes, fish inadvertently pick at corals. In the case of large colonies, this is pretty harmless, but for a small frag, it can be a disaster.*

The same can be said for invertebrates, which will often rest on corals, causing them to close their polyps. Again, this is of little concern for a large colony, but it can greatly impede the growth of frags.

Freshly cut frags require multiple dips to aid in the healing process. Trying to pull frags out of a large tank can be frustrating to you as well as stressful to the tank's livestock. Having a dedicated frag tank allows you to display corals in a fashion that allows for easy access.

A frag tank needs to maintain the same pristine water quality as a display reef does. This means things like protein skimming and carbon reactors need to be implemented. However, frag tanks can be much smaller than a fully stocked display reef, so the need for oversized (thus expensive) equipment disappears.

Good water circulation is vital for healing frags, so a high-quality circulation pump is necessary. Lighting is also a vital component, and it's best to opt for a lighting system that allows on-the-fly adjustments. That way, you can offer healing or newly acquired frags some time to acclimate to lighting conditions without the risk of bleaching. A wide variety of LED lighting systems offer this and a host of other customization features.

One popular option is to plumb your frag tank into your existing reef. This allows the two tanks to share filtration. Under this circumstance, you can set up the frag tank with a simple bare bottom and egg crate, and it wouldn't need a large quantity of live rock. The bare bottom allows for easy removal of debris, meaning you won't need a cleanup crew.

As I mentioned before, cleaner invertebrates have the terrible habit of stressing corals, thus slowing the growth rate of small frags. In a large display reef, they are a vital part of the captive ecosystem, but in a frag tank, they become a hindrance.

No Skimping on Skimmers

Q I am getting ready to upgrade my protein skimmer, and I'm wondering what constitutes a "high-end" skimmer? What are features to look for, and what are things to avoid?

Wade Bentura
Lexington, Kentucky

got a question?

Send your questions about the saltwater side of the aquarium hobby to "Q&A," T.F.H. Publications, P.O. Box 427, Neptune, NJ 07754, or submit via email to editor@tfh.com. For answers to more time-sensitive questions, opinions on your setup, or just to converse with like-minded members of the aquarium community, please visit the *TFH* Forum at forums.tfhmagazine.com.

A Skimmers come in all shapes, in all sizes, and with a variety of technology. Skimmers today can be outfitted with automatic waste collectors, which sense when skimmed material has filled the collection cup and automatically turn off the skimmer. There are digitally controlled pumps and a variety of air silencers and techniques for maximum exposure time of air bubbles. Honestly, there are so many different options, making heads or tails of them is difficult.

When we break protein skimming down to a basic level, it's essentially mixing air with water, thus causing various organic particles to bind with oxygen molecules and be removed. Years ago, this was accomplished with an air pump-powered limewood airstone.

I look for several things in a skimmer: recirculating design, simplicity of use, shape, and ease of setup and maintenance. Most of the good skimmers today are recirculating, meaning that air makes more than one pass through the skimmer body before being pushed up into the collection cup. This gives each oxygen molecule the chance to maximize the amount of waste that binds with it.

Skimmers need constant calibration to adjust the amount of foam rising into the collection cup and maximize the quality of skimmate. I prefer a skimmer that is easy to use and calibrate. I've found that those with external digital pump controllers work best. The pump controller can mount somewhere that offers easy access, making calibration a snap.

The shape of a skimmer can allow more surface area and contact time for air bubbles, meaning that it will more efficiently remove waste. I've found that the new oval-shaped skimmers work very well, because the oval shape allows a lot of surface area without taking up more room than necessary.

Skimmer setup can be incredibly easy or incredibly frustrating. I look for one that is easily set up. This varies depending on the system you're mounting it in.

If you have a sump, skimmers that sit within the sump are very easy to set up. If you are limited on space in a cabinet, then an external skimmer may be the better option. I tend to shy away from hang-on-the-back units, as they've proved frustrating for me in the past. Skimmers need a lot of regular cleaning, so making sure you have an easily disassembled and removable unit is crucial.

Q Tank Transfer vs. Hyposaline Quarantine

I have learned of a tank transfer method to treat external parasites. How does this work? Does it really allow for parasites to be killed without using any chemicals?

Raymond Vink
Waukesha, Wisconsin

A The tank transfer method allows you to eliminate external parasites without the use of chemicals. The caveat is that it requires multiple aquariums, lots of salt water, and quite a bit of time and patience. It is perhaps the most laborious method of dealing with external parasites.

The method works by moving fish to different aquariums throughout the life cycle of the parasite. The idea is that if the parasite drops off the fish host in one tank, the fish will be in another tank before it has a chance to infect it again.

For the method to be successful, you must constantly move the fish into another aquarium each day and then drain and clean the previous tank before using it again. I know several aquarists who frequently use this method and have dedicated tank transfer systems up and running all the time.

I believe there are easier and equally effective ways of dealing with external parasites. I prefer using a hyposalinity quarantine to prevent parasite outbreaks. New arrivals are quarantined in a separate aquarium for 30 to 45 days, and salinity is kept at a salinity gravity (SG) of 1.009. This serves two purposes: First, most external parasites cannot survive in the osmotic pressure of such low salinity; and second, it reduces stress in new arrivals, as they are able to easily accomplish osmoregulation (balance internal salt levels with surrounding water) in a lower salinity.

In the event that a parasitic outbreak occurs on fish within the display tank, they can be netted and placed in a hyposaline hospital tank until the parasitic infection has cleared.

Richard Aspinall

A frag tank is a valuable commodity for the hobbyist interested in selling or trading coral frags.

Aquariumphoto.dk

A protein skimmer mixes air with water to produce foam, providing mechanical and chemical filtration to improve water quality and clarity in a marine aquarium setup.

Q

A Dose of Advice

I can't seem to understand iodine dosing. Some literature treats it as a crucial element in a successful reef, while other successful aquarists don't even monitor it. Is iodine dosing necessary, and is it even vital to monitor iodine levels in a reef?

Brendan Arcia
Reseda, California

A

For years, I dosed iodine and kept a very specific iodine concentration in my reef. I purchased a digital monitor and made it a part of my weekly dosing regimen. My reef looked great, and growth was strong.

Two years ago, I began doing more research on iodine in reef aquariums, and I stumbled upon some research that suggests that algae are the only organisms that benefit from iodine dosing. I stopped dosing but occasionally test iodine levels during routine tank maintenance. My reef still looks great, and growth is just as good.

Iodine is often touted as an aid to repairing coral tissue damage caused by over-illumination in our aquariums. This function has been called into question by researchers who have studied the uptake of iodine in reef animals. While it has been shown to be used by macroalgae, the verdict is still out on how much other organisms use it. Seawater contains a natural iodine concentration, but it's unclear as to which animals benefit from it or how quickly they absorb it.

A concern arises that by dosing iodine, we may be replenishing it faster than it is being used up, thus leading to an overdose. I don't personally have an opinion on dosing iodine. As with any other element, if you're dosing it, then it's crucial that you test for it as well. As long as iodine concentrations in your reef remain in check (around 0.006 ppm), then it shouldn't do any harm.

If you're making regular water changes, your iodine levels should remain balanced, as this element is often provided by a salt mix. Some aquarists have reported that iodine dosing is vital to maintaining healthy soft corals as well as zoanthid polyps. I personally haven't seen evidence of that, and I keep a variety of zoanthids that are thriving without constant iodine dosing.

If you opt for a methodology similar to those that put less emphasis on water changes and more emphasis on additives, then I would imagine iodine dosing would become crucial. I have experimented with a few of these new methods, but I always end up coming back around to doing regular water changes. For me, regular water changes provide fundamental elements for a healthy reef, manually automating things like dosing iodine.

Q

Acclimation Affirmation

My local fish store's staff recommends a two- to three-hour drip acclimation for all new marine fish. Is that really necessary? Wouldn't spending that much time acclimating do more harm than good? What is a reasonable approach to acclimation?

Daniel Frillman
Austin, Texas

A

Acclimation is a vital component to the long-term survival of captive marine fishes, yet it's very misunderstood. There is also a lot

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of conflicting information out there about what constitutes a proper acclimation. Some aquarists say simply floating the bag for 15 minutes is a thorough acclimation, while others recommend long, drawn-out procedures. I believe that meeting in the middle to some degree offers the best and most effective approach.

Acclimation serves to gradually adjust one environment to another, so that fish don't become shocked and suffer potentially fatal stress. We must first understand which environmental factors stress fish when those factors abruptly change.

Osmotic pressure, pH, and salinity can all cause a great deal of stress if altered rapidly. Many aquarists think that temperature is a major factor as well. In fact, fish can tolerate a rapid temperature change of up to 10°F (6°C). Fish in the ocean will often encounter thermoclines, or sudden changes in water temperature.

Jay Hemdal

The drip method is an acclimation technique that involves a slow and controlled release of water through tubing.

Other parameters that need to be tested include pH and salinity. Fish can tolerate a rapid salinity change of up to 0.004 SG. It is best to match pH values as closely as possible.

All these things depend on the condition of the shipping-bag water. If the bag water has a pH and salinity value close to that of the aquarium, then a short 20- to 30-minute drip acclimation will suffice. In most instances, if a fish has been purchased from a local shop and brought straight home, this acclimation is enough.

It's important to remember that when fish are purchased online, however, special acclimation considerations need to be taken. Having an ammonia detoxifier on hand, as well as air pumps and heaters, is vitally important. Fish shipped overnight can arrive in water with a buildup of CO_2 *and ammonia as well as varying temperatures. As the water warms, previously organic ammonia can become inorganic and thus toxic.*

Shipped fish require ammonia detoxifier before the water is warmed and oxygen is provided. Supplying fish with an airstone and heater allows the water to warm, while a strong and steady drip acclimation adjusts other water parameters.

Contrary to what many aquarists believe, drip acclimations should not be painfully slow. In fact, it benefits your new specimens to give them a quick, steady stream of water. Even for fish shipped overnight, this steady drip acclimation can have them ready for their new environment in no more than one hour. Just be sure to test water chemistry to verify that everything equates.

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ask jack

Jack's Discus FAQs

Jack Wattley is worldwide the most recognized name in discus breeding. Breeder, judge, collector, scholar, Jack is the foundation on which modern discus keeping has been built. He has been sharing his experience and knowledge—and the discus he breeds—with aquarists throughout the world for decades, and just one of his many awards was his recent Lifetime Achievement award from the ACA. Long past the age at which most people retire, he still serves as ambassador of discus and goodwill across the planet.

jack wattley

pH

What is the best pH for discus water? My water is such that I can quickly adjust it to what you consider to be ideal.

To a great extent, the role that pH values play in discus care is overplayed. Captive-bred discus can be successfully maintained in pH as low as 5.0 and as high as 7.2 to 7.5.

Temperature

I've had success breeding discus fish, but I don't know whether I should keep the young at the same temperature as that of the adult discus when I move the young to the parents' tanks.

We keep all our discus tanks at the same water temperature of 82° to 84°F (28° to 30°C).

Water Changes

How often do you change the water in your discus tanks, and what amount is changed?

Approximately 40 percent is removed daily for all discus with the exception of the very small discus, where approximately 30 to 35 percent is changed per day.

Tank Size

What tank size is suitable for a pair of discus?

We keep all breeding pairs in standard 20-gallon (76-liter) tanks, although I've had discus spawn successfully in much larger tanks.

Life Span

What is the life span of discus in the home aquarium?

If well cared for, discus can live up to 10 years or maybe even more for some long-lived individuals. I've had discus successfully breed for approximately five years, and in a few cases, I've kept discus for more than two years after the initial five years of their spawning life cycle.

Breeding Age

My two pairs of adult discus have not spawned, and all four fish have been in my tanks for the past 19 months. You have said that at the age of about 12 months, the discus should be of age for spawning.

Are you certain that your two pairs of discus are confirmed breeding pairs? I've had many confirmed discus pairs that had not begun to pair off and successfully raise young fry until the age of 19 to 20 months. Give your discus another eight months, and if you still haven't had any success, I would recommend breaking up the pairs and crossing them with other adult discus, if possible.

Peat Moss

Is peat moss necessary in discus tanks?

Under some conditions, peat moss can be a useful addition to any tank water for discus. To some extent, peat is excellent for lowering the water pH. I find that the best-quality peat moss available for discus water is from eastern Canada and is generally not more expensive than the somewhat lesser-quality peat moss that is readily available here in the US.

Well Water

I have access to a well on my property. I use the water for gardening (my plants and lawn), and I wonder whether the water can also be used for my discus.

Aaron Norman

A discus can live up to 10 years, maybe even longer, with proper care and tank conditions.

In many cases, well water can be very good for discus, especially for young, growing discus. Well water generally contains large amounts of minerals that are needed for proper growth of young discus. How deep is your well? To avoid any harmful contaminants in the well water, the water should come from a well that is at least 65 to 70 feet (20 to 21.5 meters) deep. However, because of the high amount of salts in the water, it's not suitable for adult breeding (or ready-to-pair-off) discus. But well water can be added in small quantities to reverse osmosis water for adult discus as a means of adding trace minerals.

Vitamins

Should any vitamins be added to the water in discus?

Vitamins are very important in the diet of all tropical fish, including discus, but not added to the water.

Feeding Schedule

How many times daily should I feed both my adult discus and my newly purchased half-grown discus? The discus breeder fed his discus once a day.

I feed our adult discus once a day and omit a feeding once every 10 to 12 days. However, all other discus—including fry and older discus that are still growing—are fed at least three times a day, without skipping a day.

Tank Cover

Should it be necessary for me to maintain a cover over my discus tanks? I currently don't cover any of my tanks.

Yes, it is a very good idea and a measure of insurance to have your discus tanks covered. We don't cover any of our tanks, because we are in and out of them often, but remember that discus are great jumpers when startled and can practically fly out of an uncovered tank.

Microscope Value

Should I purchase a microscope in order to view the fecal matter of my discus when it looks as if they are having a problem? I know that microscopes are expensive, so do I really need one?

If you're in a four-star restaurant with three other people, and it's your turn to pick up the tab, you will surely pay more for dinner than you would pay for a suitable microscope, so I'd certainly say "go for it!"

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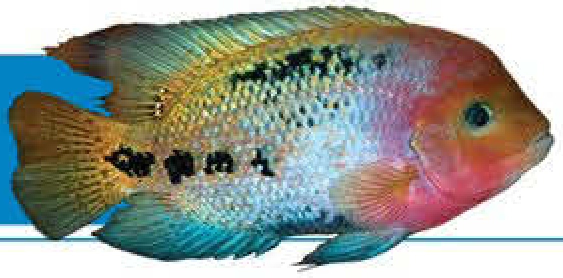


cichlid world

A Look at *Julidochromis*

ted judy

photographs by the author

Known as julies, fish in the genus *Julidochromis* (Boulenger, 1898) are lamprologine cichlids that inhabit rocky and intermediate habitats throughout Lake Tanganyika. All the species have an elongated, cylindrical body shape with a small toothy mouth.

They are all marked with contrasting longitudinal stripes that run the length of the body. Species that are found in closer proximity to rocky crevices may also have a pattern of vertical bars that, in combination with the lateral stripes, give them a checkered appearance. The dorsal fins are long and patterned with colors similar to those on the body of the fish, and the caudal fin is always rounded.

Julidochromis Species

There are currently six species in the genus, divided into two well-defined subgroups. As with *Apistogramma* and other genera that have a wide range of forms between the species, the concept of subgroups within a genus is often a popular convention more than a scientific one. The type species *J. ornatus*, *J. transcriptus*, *J. dickfeldi*, and some undescribed forms comprise the first group.

Julidochromis ornatus (Boulenger, 1898)

The type species of the genus, the golden julie has a lake-wide distribution, found in rocky zones with very clear water. It is a distinctively golden yellow fish with strong black lateral stripes on the upper half of the body and blue trims to the fins. It is a small species, rarely growing larger than 3 inches (7.5 cm). There is little sexual dimorphism, which is typical for the entire genus, though males are usually larger.

J. transcriptus (Matthew, 1959)

Another small species that is probably the most diverse in different location forms, cross-band julies are characterized by a combination of lateral stripes and vertical bars, giving that checkerboard pattern. But there are populations with reduced stripes, giving the fish a banded pattern. The color combinations are black stripes and bars on a body ranging from white to yellow, with the presence of the vertical bars being the most obvious diagnostic feature separating the fish from *J. ornatus*.

J. dickfeldi (Staek, 1975)

Dickfeld's julie is a bit of an enigma. It has a unique color pattern, with a blue sheen over a greenish-gray body color and heavily patterned fins. The nose of the fish is more pointed than that of other julies, and its feeding style is more similar to *Chalinochromis* species. *J. dickfeldi* grows to about 4 inches (10 cm), a little larger than the two other small species, and has a relatively small distribution in the lake.

The second group consists of the three larger species, *J. regani*, *J. marlieri*, and the newly described *J. marksmithi* (formerly *J. cf. regani* "Kipili"), which are not only larger than the three species in the small-fish group but also have more laterally compressed bodies, smaller lips, and wider fins.

J. regani (Poll, 1942)

Regan's julie grows to about 6 inches (15 cm), and unlike the smaller species, it is the female that grows larger than the male. This is the only species in the genus with four lateral stripes, with the extra stripe running the length of the body under the lateral-line stripe. The colors are a light sandy-brown body with darker brown stripes. It has the largest distribution of all the species in the genus and inhabits the intermediate zone between rocky areas and open sand.

J. marlieri (Poll, 1956)

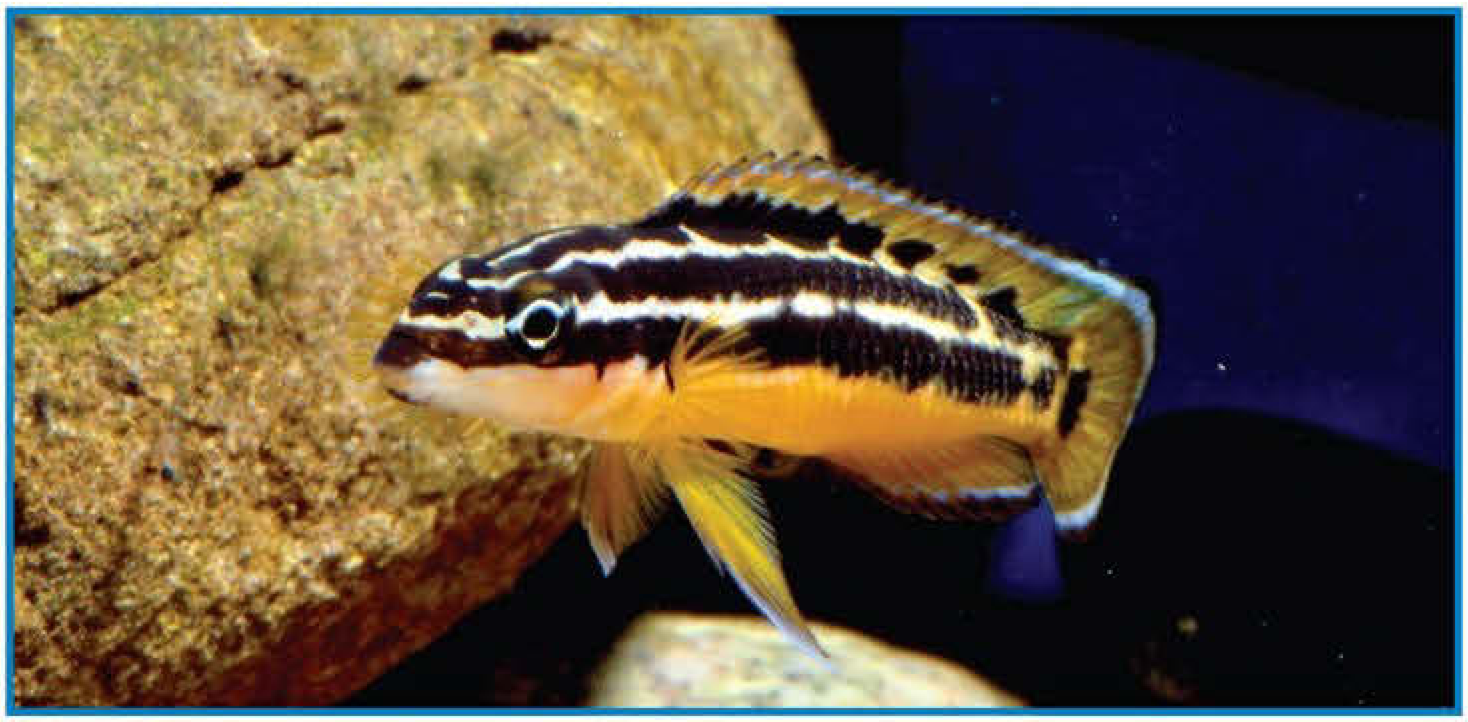
Marlier's julie is similar in coloration to *J. transcriptus* but lacks the smaller species'

Ted Judy is an aquarist with over 25 years of fishkeeping and breeding experience. He is a generalist who enjoys all types of fish, from anabantids to tetras, and always finds plenty of space in his fishroom for species from West Africa—especially the dwarf cichlids. Ted has served on the Board of Trustees of the American Cichlid Association and is an active member of the Milwaukee Aquarium Society. Ted also maintains the websites www.tedsfishroom.com and www.forum.apistogramma.com.

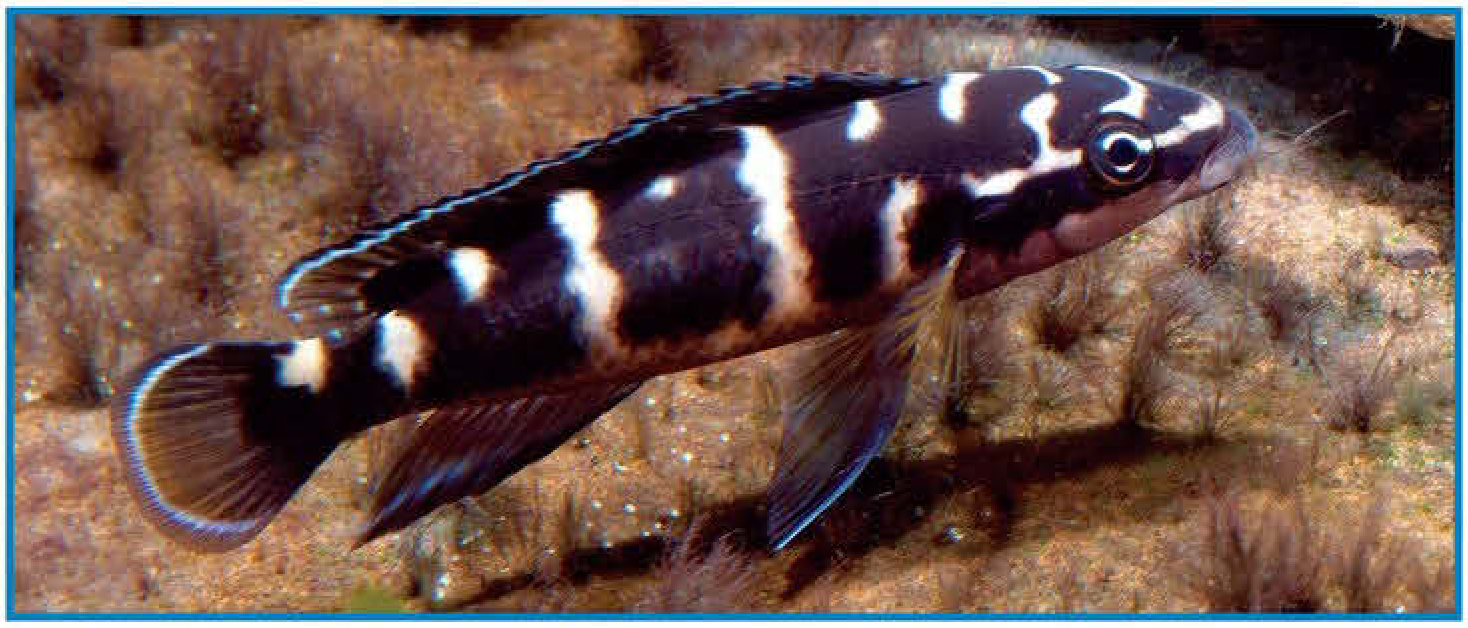
white belly and grows to be a much larger fish. The female *J. marlieri* is also larger than the male, which seems to be a pattern in the larger species. There is some debate about the population of fish at Gombé on the northwest shore of the lake. Initially identified as *J. transcriptus*, this is now considered by many people to be a dwarf variety of *J. marlieri*. The Gombé form is not only characterized by its smaller size, but it has greatly reduced lateral striping, giving the fish a banded look.

J. MARKSMITHI (BURGESS, 2014)

The newest species in the genus has been well known, and very popular, in the hobby for many years as the Kipili regani (*J.* cf. *regani* "Kipili"). The color pattern is as similar to *J. ornatus* as it is to *J. regani*. The Kipili julie has a bright yellow-orange body color and only two complete black lateral stripes: the lateral line stripe and the line just above it. The dorsal stripe extends only to the middle of the fin, where it breaks into spots and disappears. The belly stripe exists only on the lower portion of the face, unlike *J. regani,* in which the stripe continues for the length of the body. The female Kipili are larger than the males, and it is considered to be a very shy fish.



■ *Julidochromis ornatus* is the type species of the genus.



■ *J. transcriptus* has a wide distribution in Lake Tanganyika.

Keeping

As diverse as the forms and species can be, the methods for keeping and breeding them are just about the same. The only difference is in tank size, with the larger species needing more space.

The water parameters in Lake Tanganyika are famously hard and alkaline, and providing the right water chemistry for julies is hard to get wrong. When in doubt, add cichlid salts. Both general and carbonate hardness needs to be composed from a variety of salts, not just basic aquarium salt. Magnesium, calcium, and other minerals are important, and there are many cichlid salts on the market that are designed to provide the right chemical environment for Lake Tanganyika cichlids. Temperature should hover in the range of 74° to 78°F (23° to 26°C).

A disadvantage to hard, very alkaline water is that ammonia is more toxic than in more acidic water. Lake Tanganyikan cichlids are notoriously sensitive to ammonia, nitrite, and nitrate, so very clean water is a must. One method of keeping the water very clean is to do large, frequent water changes, but that is also problematic with some Tanganyikan cichlids. Smaller, infrequent water changes cause fewer problems. So the solution is in dilution.

Tank sizes need to be larger than you might expect. A mated pair of 2- to 3-inch- (5- to 7.5-cm-) long golden julies would be perfectly happy in a 10-gallon (38-liter) tank, but an aquarium that small will not provide the necessary chemical stability. A 20-gallon (76-liter) "long" or 30-gallon (114-liter) aquarium is a better choice for a pair (not only because you will be able to perform water changes less frequently, but also because when the pair starts to spawn, they are going to fill up the tank with offspring).

Highly efficient biological filtration is also important. When ammonia is produced, the beneficial bacteria need to reduce it to nitrite and nitrate very quickly. High nitrates are harmful as well, so keep those knocked down by performing regular (but not large) water changes and cleaning the filter media frequently.

When you clean a sponge filter or filter pad, you do not want to see dense sludge coming out of it. That organic waste is the source of nitrate, and when it is in the system, it is causing problems. Washing out the filter media frequently will not only remove the dirt, but it will also keep the bacteria colonies in a state of growth. Growing colonies are faster and more efficient reducers of nitrogenous wastes than old colonies are.

Feeding

Julies are macro-invertebrate feeders that use their pointed faces, thick lips, and toothy mouths to pick small insect larvae, worms, crustaceans, and anything else small and alive from the surface of the algae-covered rocks where the hunt. They are not very picky about food in the aquarium, but the best diet is one that emphasizes proteins from invertebrate animals.

Live foods are great for conditioning fish to breed. *Artemia* nauplii (baby brine shrimp), alive or frozen, is an excellent food for these small-mouthed predators. Small worms, such as grindal worms and microworms, are also a good option. A staple diet of high-quality flake foods or small sinking pellets will also suffice. Sinking food is important. These small cichlids are very bottom-oriented and may not go to the surface for a floating food.

The hardscape of the aquarium should include a lot of rocks piled up to produce many narrow crevices and confined spaces. Julies are shy fish that will spend a lot of time in the rocks, but you will see more of them if they have a lot of places to hide. Give them plenty of places to hide, and they will be a lot happier.

■ *J. marksmithi* from Kipili is the most recent member of the genus to be described.

Breeding

Julies are not particularly aggressive to others of their kind, until they find a mate and start to defend their territory. The best way to form a compatible pair is to start with several young fish at the same time. Let them grow up together, and eventually a pair will form. Julies will readily crossbreed, so only one species should be maintained in the aquarium. You will know that a pair is preparing to spawn when they push other cichlids into areas of the tank away from the spawning site. Remove the nonbreeding fish when that happens, and let the breeding pair have the entire aquarium to themselves.

All julies are cave-spawning species that like to lay eggs in narrow spaces between flat rocks or on the roofs of artificial caves (such as flowerpots, cichlid stones, etc.). You are not likely to see the eggs or the larvae, and there are no noticeable color changes in the adults when they spawn. The first indication that the pair is breeding may well be the appearance of the fry, which are very small and will stay in close proximity to the rocks.

Live baby brine shrimp and microworms are the best foods for fry, but be careful not to overfeed. *Julidochromis* spp. do not grow quickly when the conditions are perfect, so trying to force them to grow with more food is only going to foul the water and kill the sensitive fry. A mature aquarium will provide a lot of microorganisms for the fry to eat, so all you need to do is give them a better source of protein, in small amounts, once or twice each day. If live foods are not available, finely chopped frozen foods will also work, as will high-quality gel and flake foods.

The parents will not eat the fry, and neither will any older fry in the tank. An actively breeding pair will spawn repeatedly over and over again, filling their territory with offspring. The older fry may even play a role in rearing younger siblings, but this is still an unproven hypothesis. The only thing you need to worry about is making sure that there are not too many fish in the aquarium. Once every two or three months, remove the rocks, clean the detritus out from under them, and catch as many offspring as you can, moving them to a grow-out tank. The adults will just starting filling up the space all over again.

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the planted tank

Aquatic Plants of Africa and Madagascar

Amanda Wenger is a lifelong hobbyist who inherited a love of aquaria from her father, when he gifted her with her first fish at age two. A decade and a half later, she started putting plants in the fish tanks and was hooked. Today, she lives in Connecticut, where she's the current President of the CT Aquatic Plant Enthusiasts (CAPE) and, with the assistance of her family, maintains a well-planted fishroom and a hobby-sized greenhouse filled with aquatic plants. She's also part of the moderating staff at AquaticPlantCentral.com. Aside from the aquarium hobby, Amanda is a professional illustrator and graphic designer with a soft spot for wildlife illustration.

amanda **wenger**

While the bulk of the aquarium hobby's readily available plants hail from Asia and the Americas, sources such as Africa and its giant island neighbor, Madagascar, shouldn't be overlooked. One of the hobby's staples, the genus *Anubias*, is of African origin. Madagascar yields one of the crown jewels of the aquarium hobby, the spectacular Madagascar lace plant (*Aponogeton madagascariensis* complex).

Additionally, while hobbyists who are focused on African fish tend to gravitate toward the continent's spectacular array of plant-devouring rift lake cichlids, Africa also provides hobbyists with a selection of stunning tetras, killifish, and cyprinids that make lovely inhabitants for a biotope tank.

Madagascar

You might be wondering why I treat Madagascar as a separate entity, despite it being an island off the coast of Africa—surely, it should be included in the concept of Africa as much as we think of Japan as a part of Asia. This mostly has to do with plate tectonics and the biodiversity of the island.

Once upon a time, India, Australia, and Madagascar were all stuck together in one landmass (along with what would become Antarctica). Then somewhere along the way, it all broke up—first Australia drifted off into the Pacific to do its own thing; then India broke off and crashed into Asia, forming the Himalayas; and Madagascar wandered along until it reached its current position off of Africa.

As a result, the flora and fauna of these three landmasses generally have a lot more in common with each other than they do with their current neighbors. This is why some aquatic plant genera can be found in two or three of the aforementioned places, such as *Aponogeton* species being found in both Madagascar and India.

As Madagascar drifted closer to Africa, some of its plants managed to hop over to the mainland, as evidenced by the presence of *Aponogeton* species in Zimbabwe, Botswana, and Zambia—similarly, once India attached itself to Eurasia, the *Aponogeton* populations traveled along the coast to reach Southeast Asia (but not north into China, since the Himalayas created an impenetrable migration barrier for Indian flora).

African Epiphytes

Several African plants can be found in fast-moving rivers and streams and, therefore, have adapted to this environment by growing attached to rocks and other fixed objects rather than rooted into a substrate that might be there one day and washed away the next. *Anubias* are a classic example of this. Found in the tropical streams and bogs of West Africa, they use their tough rhizomes and roots to attach to rocks along the edges of the water and grow in a mix of submersed and emersed habitats, depending on the seasonal water level.

The stunning African water fern *Bolbitis heudelotii* shares the same habitat as *Anubias* and grows in more or less the same manner. In the aquarium, this is a beautiful centerpiece plant, with dramatic, foot-long fronds that look amazing planted in a clump at the base of driftwood pieces. The dark, textured foliage adds a lot of dimension to the aquascape and creates a dense shelter for shy fish or fry. As with *Anubias*, *Bolbitis* rhizomes must be secured to a rock or driftwood and exposed to open water; if you plant them in the substrate, they will rot.

Swordplants of Africa

While not closely related to the swordplants of the Americas (genus *Echinodorus*), the obligate aquatic *Aponogeton* species are sometimes referred to as such due to their long, lanceolate leaves and large size. Certainly, they can be used with the same impact in a planted tank. They are, due to their size, generally unsuitable for aquariums with a capacity of less than 50 gallons (190 liters), and even then, particularly vigorous specimens can take over most of a tank on their own.

The genus *Aponogeton* once occupied a far broader range in ancient history, with presence in what would eventually become North America and Greenland as well as its current distribution. However, at some point, the population bottlenecked and only the species of Madagascar, India, and Australia remained, subsequently spreading outward as previously described.

Aponogeton species in general prefer cool, soft water, with low levels of dissolved solids and some degree of water flow—their natural habitats are gentle- to moderate-flowing rivers, for the most part. As such, they are appropriate for setups housing cool-water, riparian fish like danios, barbs, and certain killifish and rainbowfish. The native killies and rainbows of Madagascar, *Pachypanchax* spp. and the bedotiids, respectively, pair well with these plants, as they share a habitat in the wild.

Among the Malagasy species obtainable by hobbyists, *A. ulvaceus* and *A. boivinianus* are probably the most readily available, with *A. longiplumulosis* and *A. madagascariensis* also being easy enough to come by. *A. capuroni* can be tracked down by a slightly more dedicated hunter. African species are offered less frequently, but *A. distachyos* makes an occasional appearance in specialists' collections, or, oddly enough, in the pond trade, where it's said to be quite hardy.

Aquariumphoto.dk

■ *Anubias barteri* var. *barteri* is an undemanding plant that hails from West Africa.

If a single plant were to sit as the pinnacle of the planted tank hobby, many would point to the Madagascar lace plant, from the *A. madagascariensis* complex. Depending on which taxonomist you ask, this is a complex of either three species or a single species with three varieties—I'm inclined to believe the latter but refer to the group as a complex just for the sake of inclusion. The species/varieties are *A. madagascariensis* var. *madagascariensis* (the type variety), *A. m.* var. *major,* and *A. m.* var. *henkelianus.* This is arguably the most distinctive plant in the hobby, due to its bizarrely fenestrated leaves (meaning that they have latticed holes in them like little window panes). It is a plant of decidedly cooler waters, preferring temperatures ranging from the upper 60s°F to the lower 70s°F (19° to 23°C).

In general, *Aponogeton* species kept over 75°F (24°C) will burn through the energy stored in their bulbs faster than they can create and store new energy, leading them to eventually burn out after awhile or go dormant and never recover.

It is not unusual for *Aponogeton* species to go through periods of dormancy, where the leaves die back and the bulb appears dead. Depending on which species you have, you can either leave it in the tank—this is suitable for most of the Asian species—or put it into a container of damp sand and let it sit in a quiet, cool, out-of-the-way place, like the basement, for a couple of months.

In this respect, it's very much the same as wintering-over common tender garden bulbs like *Gladiolus* and *Dahlia*. Afterward, replant the bulb in your tank, and with luck, it will resprout and return to its former glory.

This dormancy is an adaptation to seasonal dry periods, where plants that were once submersed may find themselves temporarily stranded. It also makes the commercial trade of *Aponogeton* species quite easy, as they can be shipped in a dormant phase with no worries of mortality from prolonged stressful conditions that can occur in shipping actively growing foliage.

African Hairgrasses

Africa and Madagascar, like every other continent save Antarctica, are home to species of the genus *Eleocharis*, commonly called hairgrass among aquarists (though technically, they belong to the sedge family). Almost a dozen and a half can be found in southern Africa alone, and some range across most of the non-desert parts of the continent.

Not all are fully submersible (some of the bigger species are first and foremost marginal plants), and none of Africa's species are typically found in the aquarium trade. Even if present, they may be hard to identify, as many *Eleocharis* species are distinguished solely based on characteristics of the inflorescence and fruit. Given these factors, a more commonly available species (such as the giant hairgrass *Eleocharis montevidensis*) are an acceptable substitute in creating a biotope tank.

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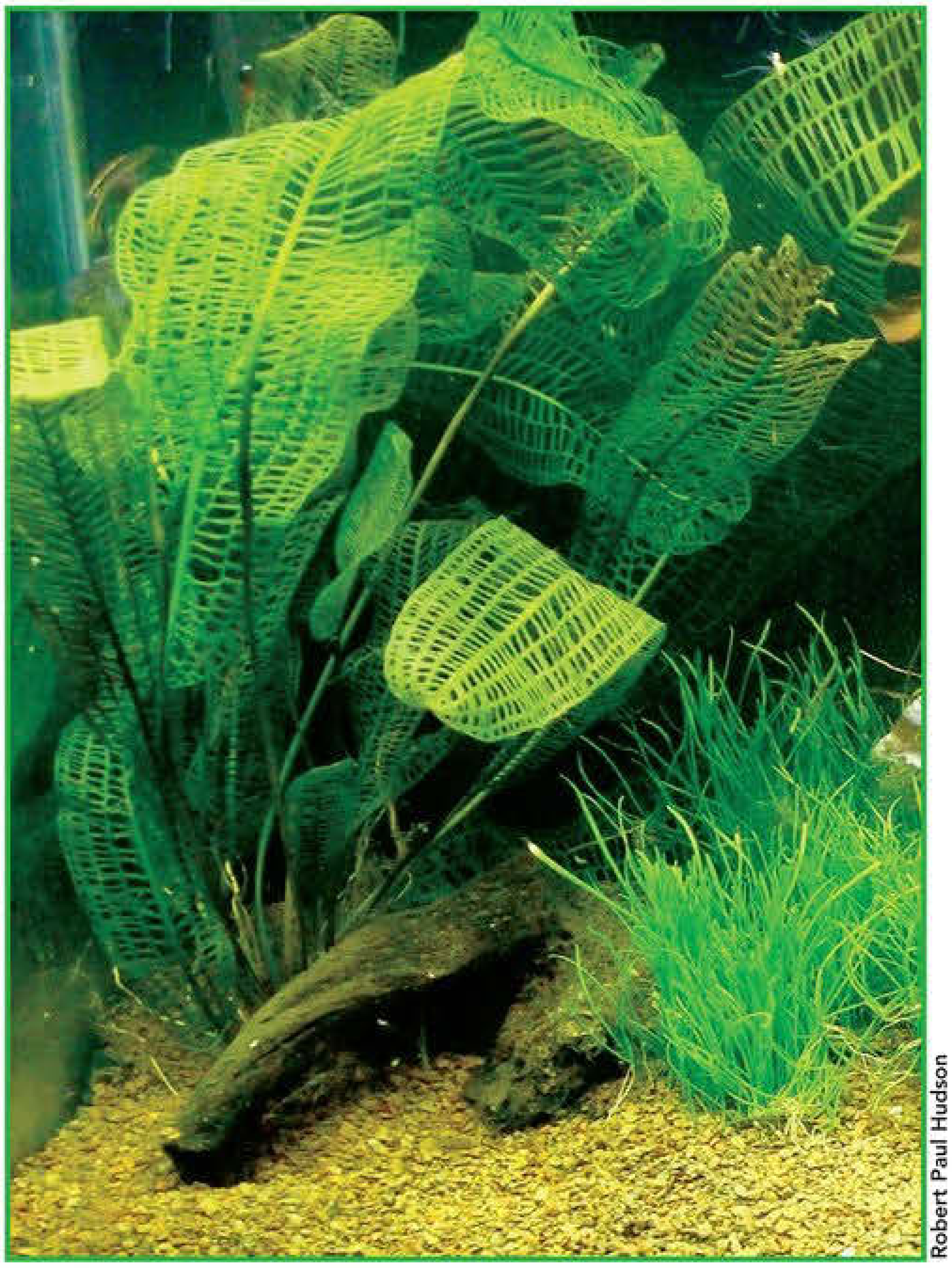
Somewhat oddly, the most commonly cultivated hairgrass species in the world is not an aquarium plant but is rather the edible *E. dulcis*, found in Africa, Asia, and Australia. The plant is grown for its large, tasty corms—you may know them as Chinese water chestnuts—those funny, round, whitish sliced things you find in your Chinese take-out dishes.

Bacopa in Madagascar

Though most of the species of *Bacopa* used in the aquarium hobby hail from the Americas, Madagascar is home to an endemic species of *Bacopa*, *B. madagascariensis*. This succulent species sports a lovely lavender-pink flower and gently toothed leaf margins. Like all *Bacopa*, it likes bright lighting. General high-tech tank conditions are suitable for its growth. It is tolerant of cooler temperatures, though it's not a frost-hardy plant.


Robert Paul Hudson

■ The Madagascar lace plant (*Aponogeton madagascariensis*) has leaves that are latticed with veins, with open spaces between them.

Another species sometimes seen in the Eurasian trade is *B. crenata*, a native of East Africa. Its cultivation requirements are similar to those of *B. madagascariensis*. Also, the circumtropical species *B. monnieri* can be found in northern Africa along the Mediterranean basin.

African *Elodea*

Although not a true member of the genus *Elodea*, the African plant *Lagarosiphon major* is nonetheless a close relative to that genus (along with *Egeria* and *Hydrilla*) and shares a similar appearance as well as occupying the same niche those genera fill in their native waters. It has strongly recurved, toothed leaves, and while the stems are somewhat fatter than the typical *Elodea* or *Hydrilla* stem, the overall appearance is nearly identical.

Unfortunately—and fortunately, as well—this is another plant that US hobbyists are unable to obtain, this time because it's a federally banned noxious weed. Ecologists learned well from the disaster that highly invasive *Hydrilla* created when it escaped to American waters and preemptively banned its African counterpart before it could gain a foothold. So far, this has worked, as the USDA's PLANTS Database reports no occurrences of the species in the US or Canada. For those looking to employ it in a biotope, make a substitution with its similar-looking (and legal) South American cousin, *Egeria najas*.

African Plants

Africa might not be the hotbed of aquarium plants that the Americas and Asia are, but it still contributes a number of well-respected hobby staples as well as a few oddballs for the collectoritis victim. "Collectoritis" is a term that plant hobbyists use to refer to individuals—myself included—who have a compulsive need to obtain and experiment with every single random species they can get their hands on. (Personally, I believe the term could apply to any hobby, but it seems to be common in aquascaping circles.)

Dreams come true !

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The Ginger Ale Livebearer (*Priapichthys nigroventralis*)

Gary Elson is that odd fisherman who brags about how small the fish he caught were. He's a writer, teacher, and over-the-top aquarist who lives in Canada. In the early 2000s, he had a monthly TFH column on small fish for small aquariums, and such fish remain his interest. He is just as fascinated by the puzzles posed from watching fish now as he was when he got his first mollies at the age of eight.

gary elson

photographs by the author

Like the late, great Rodney Dangerfield would say, livebearer keepers get no respect, and that's for one simple reason: livebearers get no respect! After all, these fish are all supposed to be super-easy to keep, right? Well let's take a closer look at that idea.

It all began, as most good things do, with simple temptation. A small bag of rare livebearers arrived from the Choco region of northwest Colombia. There have not been a lot of fish available from that region in recent years, due to the political turmoil in that beautiful country. These fish were *Priapichthys nigroventralis*, an uncommon little fish that I believed was established in the hobby, although apparently not in North America.

I brought them home and began reading. That's not exactly the best way to go about these things, but this was not a fish I had ever expected to see. I had put my 20 fish into a 40-gallon (151-liter) tank, on their own.

I knew of these fish from older pictures, and from the look of them, I expected them to be a challenge. The tiny Amazon livebearer *Micropoecilia branneri* had once occupied that tank, and I expected a similar degree of difficulty from *P. nigroventralis*. I had managed to raise a lot of *M. branneri*, but had also somehow managed to have them all die suddenly. I hoped I'd learned enough to avoid the same inexplicable disaster with this latest rainforest livebearer, while enjoying the same sort of absorbing aquarium-keeping project.

For once in my life, I was right, although not necessarily in the way I wanted to be.

Good Looks and a Strong Personality

This fish is supposed to be difficult to ship, but the entire bag of newly arrived fish looked great. Several of the females were slightly rounded in the belly, but they didn't look gravid. Livebearers are usually pretty easy to sex, but these fish take the prize—there is no mistaking a male.

The females are also nice, with large, keel-like anal fins. They are very elegant as they make their hummingbird moves through a planted tank. They cruise slowly and dart suddenly, with quick and unexpected turns. They are not fish that hide, but often, as they move through the shade and plants, they dissolve into pairs of incredibly luminous, bright blue eyes.

Unlike livebearers such as guppies, the males are relatively gentlemanly toward the females. They spend a lot of time flexing their extraordinarily long gonopodium, but they never seem to harass the females. Courtship is a quiet affair, with a low-key display and what appears to be a keen ability to take "no" for an answer: When females showed no interest in the male's advances, he would simply go back to showing off at a respectful distance. Males spar a little with each other, but no harm is done. It's easy to manage a large number of males in the same tank. It is a much more dignified livebearer than the ones we are generally used to.

They do occasionally sport minor fin injuries, often in the caudal (tail). These heal quickly, and these soft tissue nicks cause no long-term problems. I have never been able to catch sight of the cause, but I suspect there is a pecking order, especially among females.

The first surprise didn't take long. I quickly spotted what was to become a monthly sight—tinier blue eyes up in the surface weeds. I had six blue-eyed babies—their eyes were as bright as their parents'.

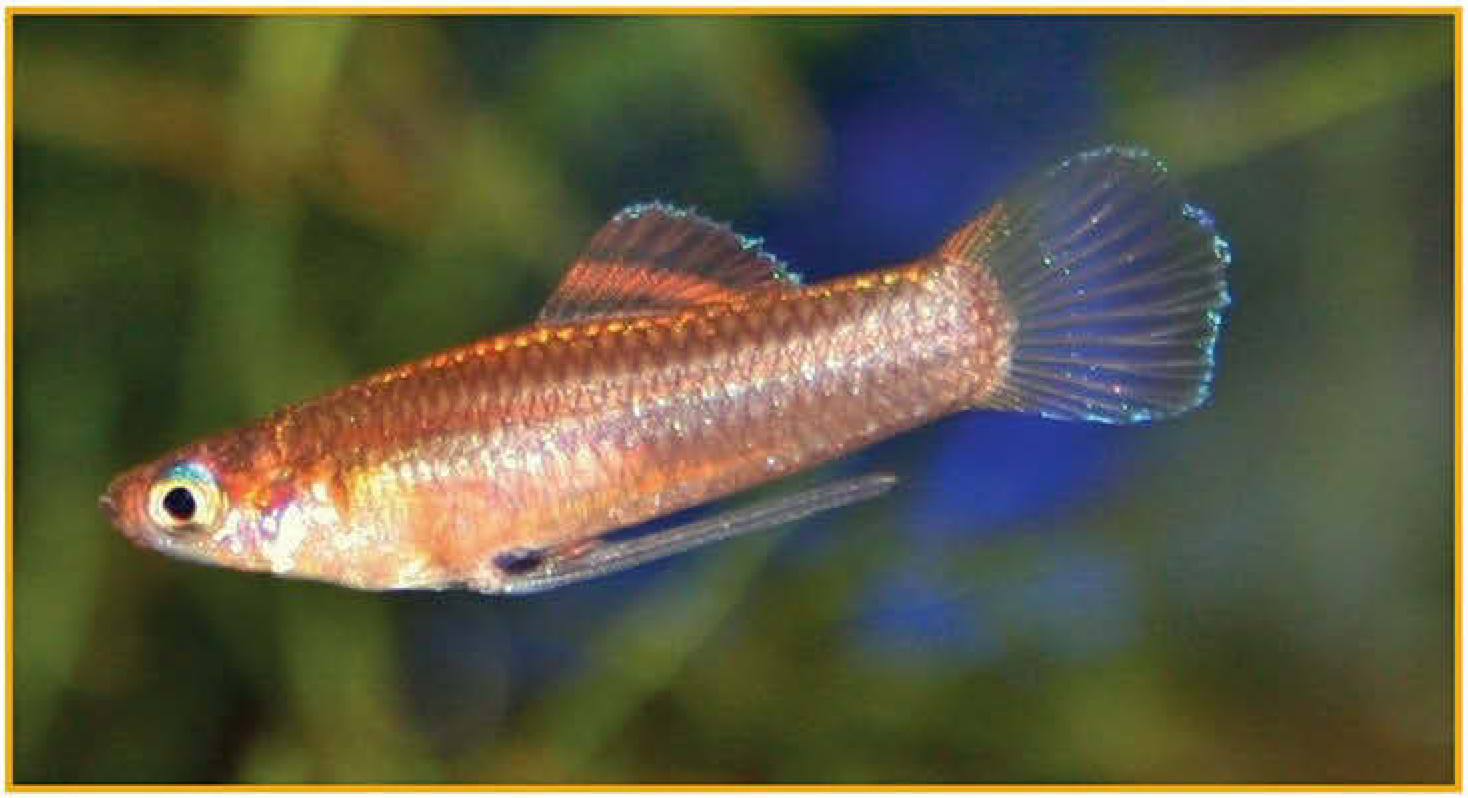
There are a few livebearers with luminous eyes reminiscent of their distant African relatives, the lampeye killies. Some of the Cuban *Girardinus* species are equally bright-eyed, but they have pale silvery bodies and offer no contrast. *Priapella intermedia*, a Mexican livebearer, is also a fine-looking blue-eyed beauty, but again, it has a pale-yellow to pearly color. As fry go, these coppery *P. nigroventralis* are quite beautiful.

Six was the exact number of females in my group, and I had six fry. Sherlock Holmes would have figured this out, but I sat there waiting for another female to drop her young.

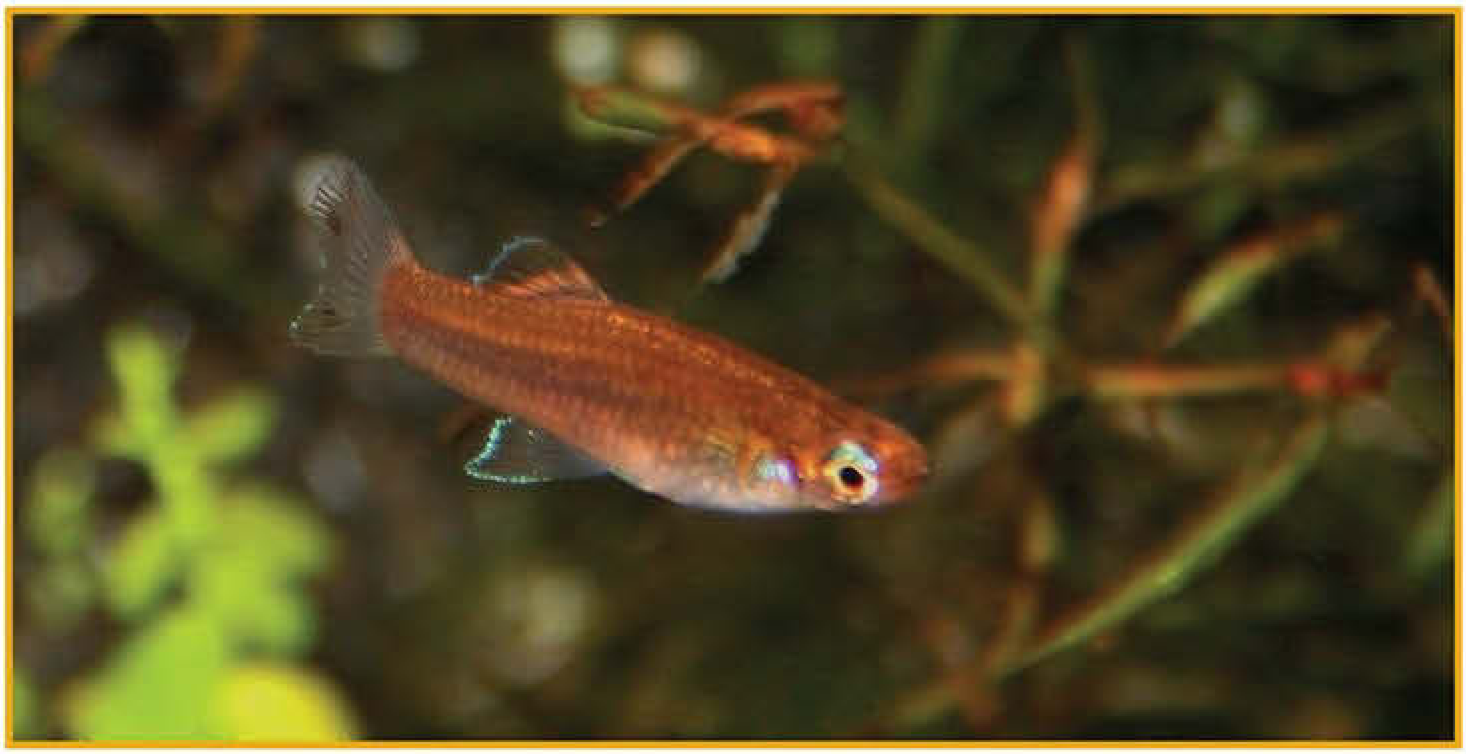
My fishkeeping buddy Alex had taken some of my original group home, as he too likes oddball livebearers. It seemed smarter to keep a rare fish in two setups. Too much can go wrong in a single fishroom. It wasn't going to be easy to replace these fish if we lost them. He called up and revealed that he had been a closer observer as only one of his females had dropped, and there was only one baby.

Soon after, his group was wiped out almost overnight for reasons he couldn't identify. That worried me. It sounded like the curse of the *Micropoecilia* was still lurking somewhere in the shadows.

As the months went on, I realized that we were not going to overpopulate the planet with these tiny livebearers. Each little electric-eyed golden female dropped a steady one fry per month. Sometimes, it seemed like there might be two from individual females in a month, but I never saw more. The fry were resilient, and with a fair degree of attention, there were few losses. They were a good size relative to their tiny mothers. But as population explosions go, it was a quiet one.



■ Ginger ale livebearer (*Priapichthys nigroventralis*), male.



■ *P. nigroventralis*, female; the eyes of ginger ale livebearers feature a splash of bright blue, which makes them stand out against a planted backdrop.

The Disaster

Pretty soon, I was well into my third generation and the numbers began to climb. That's when a real explosion happened.

In two days, they all died. Boom! Just like that. No warning, no symptoms, no survivors.

Rainforest livebearers do that. I have never been able to establish why, as they suddenly die while looking great in well-maintained tanks. My *Micropoecilia branneri* colony had crashed in exactly the same fashion, five years before. My filters were clean, the water was regularly maintained, and there had been no drastic changes in the fishroom.

I crossed my fingers for more to arrive (and since we are early in the article, the careful reader will surmise this clearly worked) and reviewed what I had learned.

Lessons Learned

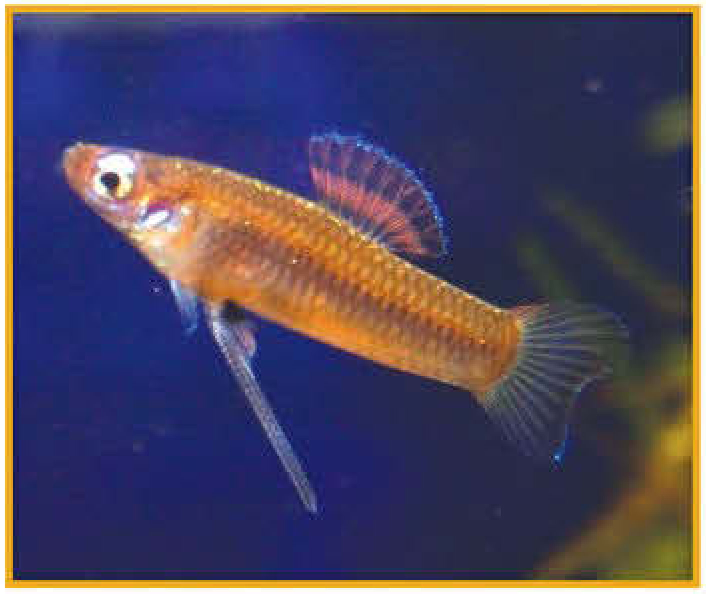
This fish was apparently from soft and acid water. I had successfully acclimated them to breed in my tapwater at a pH of 6.6 and a TDS of 120 mg/L. They seemed most active at around 73°F (23°C), but could comfortably go warmer in summer. They didn't seem to like warmer water—as unscientific as this sounds, they slowed down and seemed lethargic in the temperatures I would have offered them based on simple geography.

They liked good filtration, and seemed to hang around on the edges of the outflow. This made sense from their size, and their feeding strategy. They liked to face the current and wait, lunging at food as it arrived.

They nibbled at flake, but didn't like it. They wanted their food to be small, and did very well on freshly hatched brine shrimp and young daphnia. In a pinch, a pinch of decapsulated brine shrimp cysts, finely ground krill, or freeze-dried daphnia would do. I had a suspicion I had indirectly killed my first group with overfeeding. I resolved that if I ever got them again, I would feed them tiny amounts once a day, and no more.

I would also keep an eye out for *Oodinium* spp. parasites (velvet), the bane of the rainforest-fish keeper who overfeeds. The parasite thrives in soft water when there is decomposing food. It seems to love uneaten and decomposing brine shrimp, the very staple these tiny carnivores were thriving on. The ginger ale glow of these fish would hide the parasite very well, as *Oodinium* shows in a velvety copper tint right where this fish has...a natural glowing copper tint.

I was ready for round two, and with importer extraordinaire (and *TFH* writer) Oliver Lucanus in town, it didn't take long.



Ginger ale livebearer, male; the author's original group of *P. nigroventralis* was part of a shipment from the Choco region of northwest Colombia.

Second Chances

When they came in again, I was only able to get five. I brought them home, and within a week confirmed my mistrust of the universe. In my hastily chosen and cleaned-up 20-gallon (76-liter) tank—it had held slightly overfed killie fry—they developed velvet. I began running an ultra-violet sterilizer in the tank as soon as I saw the first clamped fin. I was very confident that I had identified and solved my mystery, and that I would vanquish the beast.

I saved one. The good news is that it was a she, and she had that familiar little rounded belly. It took two more weeks, but she presented me with something extraordinary: Twins. She had two babies. Two!

This was especially welcome—some livebearer females are able to store sperm from previous matings and use this reserve to fertilize themselves when suitable males are rare, but I had never established whether this species was able to do this. So that worked out in my favor, but I would still have to trust the extremely untrustworthy gods of livebearer sex ratios to save my project.

She proceeded to drop two fry twice, and one fry twice, over the next four months. By then, the first two fry had grown like weeds and had sexed out as males.

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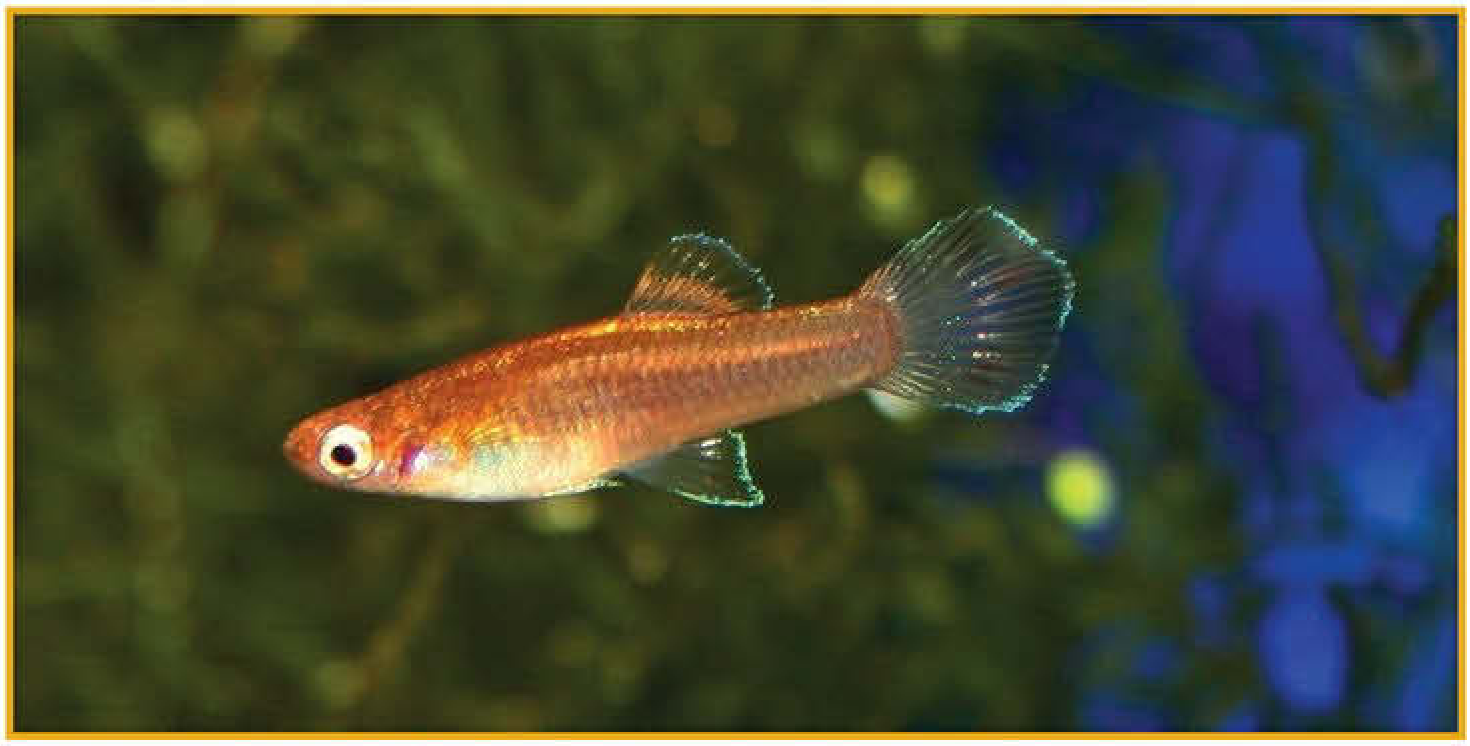
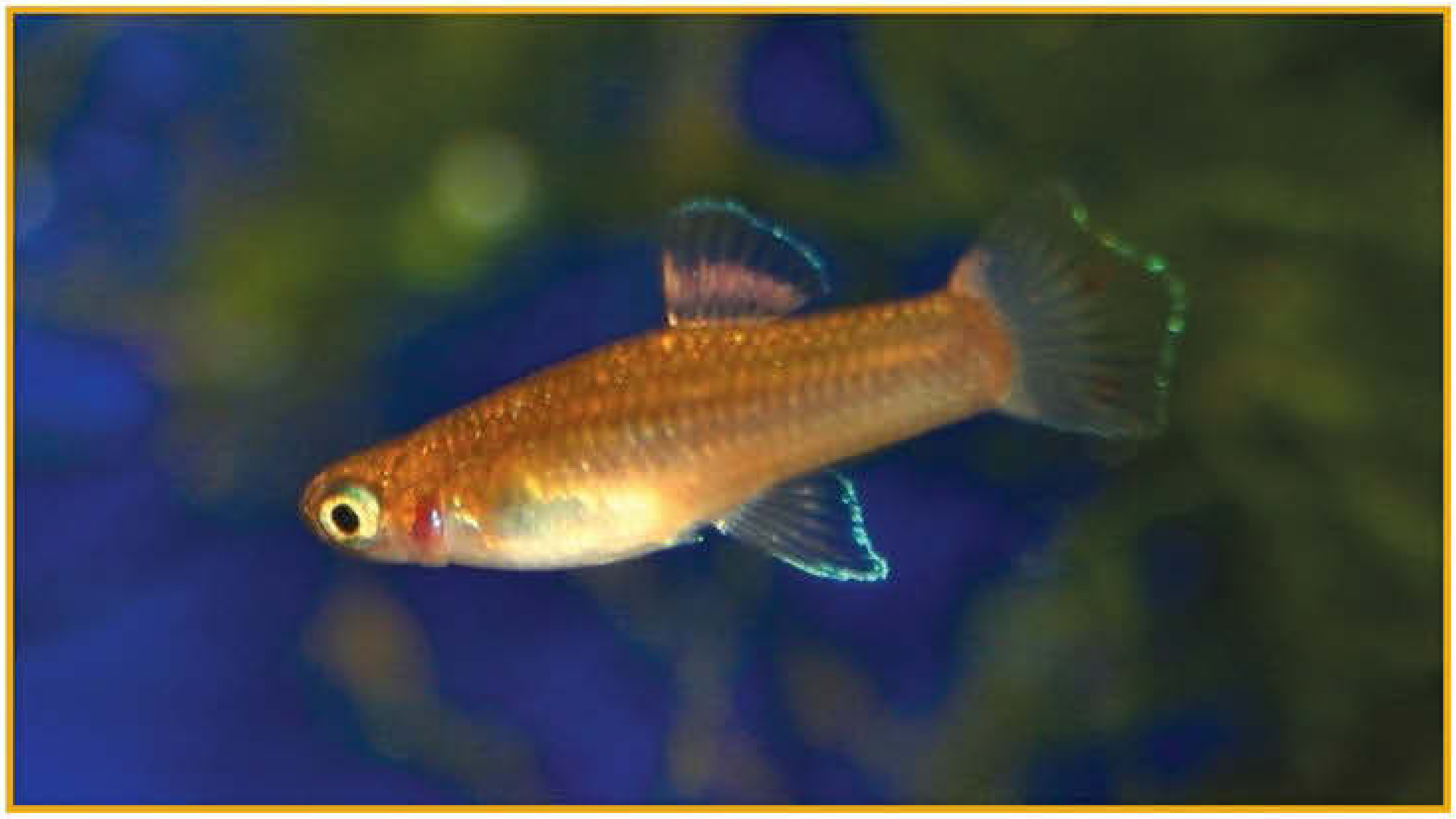


A ginger ale livebearer subadult.



P. nigroventralis, a gravid female one week before dropping her fry.

The following drops had produced a fairly even ratio. I was in business, in a not very businesslike way. I found two more wild-caught females to give me at least some genetic diversity to start my colony, and settled down to enjoy this "new" fish.

It has taken a long time, but I now have these lovely fish established in two tanks, and breeding in a slow but steady manner. A number of European aquarists have contacted me to say this fish was apparently lost to the hobby 20 years ago, and that they would like another crack at it. I hope they get one!

Small Fish, Big Respect

So, for all of you cichlid and monster fish keepers out there: Don't mock the little one-inch livebearer. I have bred dozens of cichlids, including newly imported African and South American rainforest dwarfs that didn't even have names, let alone background information. As tough as those fish could be to figure out, few have given me the fits *Priapichthys nigroventralis* has. It needs water as clean as any discus, live food, and enormous patience. With one or two fry a month, it takes a long time to get to the safe zone, population wise. It is not the most forgiving species in the world, and can quickly perish if you make even one mistake with it.

And it's worth every bead of sweat. As tiny as it is, this little ginger ale-colored hummingbird livebearer is a delicate beauty. Every visitor to my fishroom stops dead in front of their tanks, wondering out loud what they are looking at and why they have never seen anything like it before. Respect the livebearers! With luck, they will start appearing on importers' lists more often, and take their rightful place as the blue-eyed golden boys and girls of small planted aquariums.

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into the labyrinth

Betta rubra: The Misunderstood Betta

mark denaro

photographs by the author

Mark Denaro has been keeping freshwater aquariums since 1970 and marine aquariums since 1976. He currently operates Anubias Design (www.anubiasdesign.com), an aquarium and terrarium design, installation, and maintenance company serving southeastern Pennsylvania, and an importer/online retailer of new, rare, and interesting freshwater fishes, invertebrates, and plants. A former president of the International Betta Congress, Mark's primary interests are anabantoids, cichlids, and planted aquariums.

For decades, *Betta rubra* may have been the most misunderstood of all betta species. It was described by Perugia in 1893 based on his examination of 10 specimens, but the original description included neither picture nor drawing, and despite numerous attempts over the years, the species could not be found in the type location, Lake Toba in Sumatra.

Lake Toba was formed by volcanic activity (certainly not a typical betta habitat) and likely did not hold any fish species until several were introduced. The most prevalent school of thought was that *B. rubra* was a member of the *splendens* species complex and was possibly a synonym, or a local variant, of *B. imbellis*. Others believed it to be a member of the *picta* complex and possibly to be *B. picta*. Another group believed that the species did not really exist or that it was extinct.

The situation was made more difficult by the conflict between the Free Aceh Movement and the Indonesian government. As part of Indonesia, Aceh never received the autonomy that it was promised when the country was formed in 1945. Armed conflict in the area started in 1953 and continued periodically over the years, preventing betta collection until 2005.

Tan and Ng obtained five specimens that were collected in central Aceh in 2005 and used these, along with the original type material, to redescribe the species. They tentatively assigned them to the *foerschi* species complex. Hobbyists first obtained the species in 2007 and bred them soon after, confirming that they were mouthbrooders and consequently not members of the *splendens* complex.

The *rubra* Complex

In 2013, Tan redescribed *B. rubra* based on new specimens collected at several distinct locations along the west coast of Sumatra and also described the species *B. dennisyongi* in the same paper. He went on to note the clear differences between these two species and the *foerschi* complex and defined the *rubra* species group. *B. dennisyongi* is the more northerly of the two members of the *rubra* complex. It is found in lowland hillstreams and acidic swamps between the city of Meulaboh in the north and Singkil in the south.

B. rubra is found in peat swamps in the Singkil region. It is also possible that it will be found in the type location, but that seems unlikely. The habitat of *B. rubra* is very much fragmented due to the development of oil palm plantations in the area. This species is threatened or in even more dire straits, making it important that hobbyists keep the two species separate and that *B. rubra*, in particular, becomes well established in the hobby, so that hobbyists can continue to maintain the species.

The fact that there are two distinct species creates a serious issue for hobbyists, as these two species readily cross in captivity. It is probable that early importations of *B. "rubra"* included both *rubra* and *dennisyongi*, and there is evidence that some of these shipments consisted solely of *B. dennisyongi*. This is understandable, because at the time, it was thought that all these highly desirable and highly valuable fish were of one species.

Indeed, initial imports into the US sold for $1000 or more per pair, the highest price I've ever seen for any betta species.

Fortunately, the prices have come down significantly, and wild pairs now typically cost $100 to $200, with captive-bred young available for quite a bit less.

It is likely that many, if not all, captive-bred lines that originated with pre-2013 imports are hybrids. As a consequence, the aquarist desiring to work with either of these species should start with new wild stock with a known collection location in order to ensure the purity of the species. If this is not possible, captive-bred specimens should be examined closely, and their color patterns should be compared with those of wild fish. If the markings on the males do not match one of the species, it should be assumed that they are hybrids, and the hobbyist should not breed these fish but instead continue to look for fish that conform to the wild pattern.

Physical Appearance

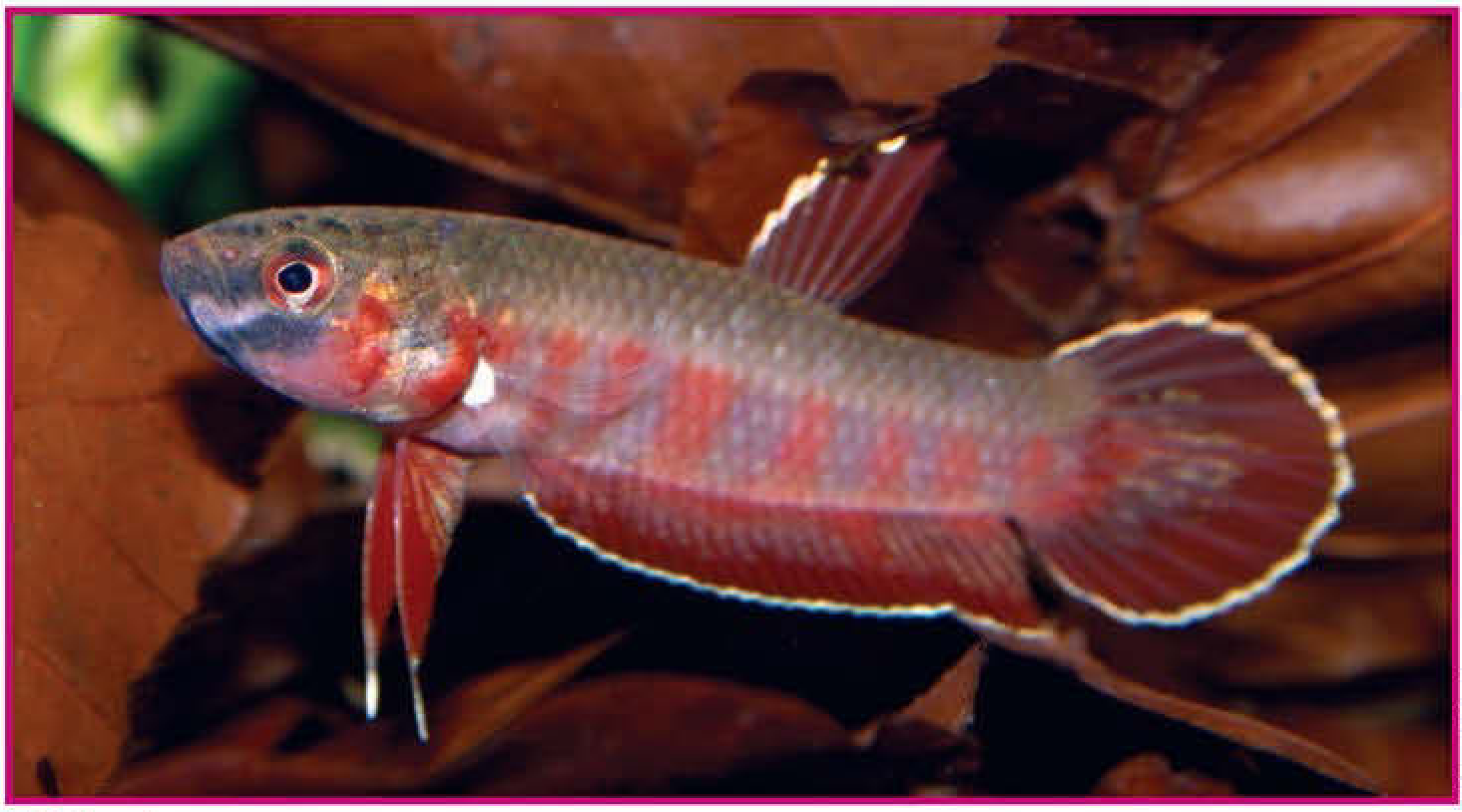
Both species have a black line running diagonally from just below the eye to the chin. In *B. rubra,* this stripe is only a couple of scales wide, while *B. dennisyongi* has a wide stripe covering approximately five scales. Both sexes of *B. dennisyongi* feature a black line that runs continuously from the eye to the operculum, while *B. rubra* has only a black dot or no coloration between the eye and operculum. The pattern on the rest of the body is similar in both species, with well-conditioned males displaying alternating red and black vertical stripes on the lower portion of the body, with lighter-colored dorsal surfaces showing a bit of green-blue iridescence.

B. rubra is the larger of the two species, with males reaching just under 2 inches (4.5 cm), while *B. dennisyongi* maxes out at about 1½ inches (3.8 cm). There is significant overlap in the maximum size of the two species, so do not rely on size for determining species.

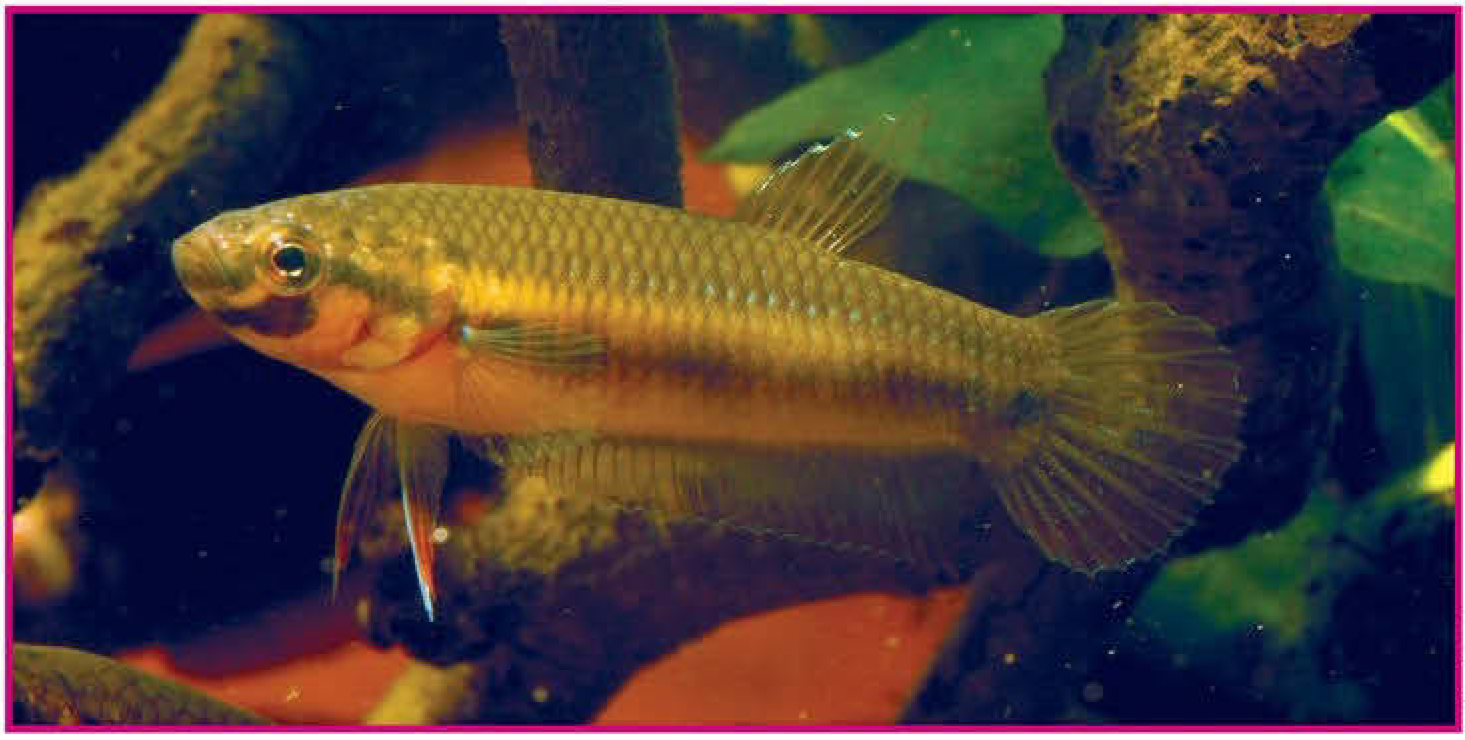
Tank Requirements

Basic maintenance is the same for both species. To maximize production of young, adults should be maintained in a species tank. A 10-gallon (38-liter) aquarium will suffice for a single pair. If they are to be maintained in a group, a 20-gallon (76-liter) long or larger aquarium should be used.

Typical of wild bettas, both species are accomplished leapers, so a tight-fitting cover is a necessity. The substrate should be dark, and some leaf litter (beech, almond, oak, or similar species) should be added to serve as hiding places and to soften the water as they leach tannins. There should be more hiding places than there are fish, and these can also include driftwood and caves made from rock or flowerpots or similar materials.


Richard Brode

■ *Betta rubra.*


Colin Dunlop

■ A female *B. dennisyongi.*

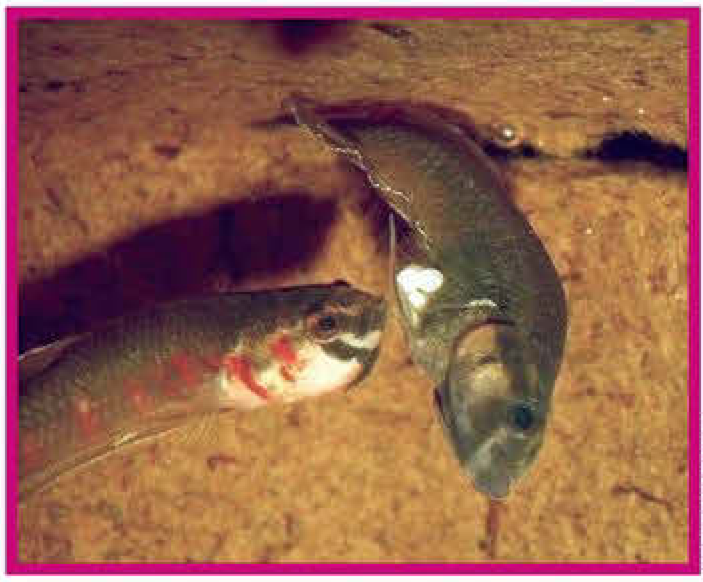
Plants may be added, but the lighting should be dim, so only species that do not require high light are suitable choices. The water should be soft and slightly acidic, with a temperature in the mid-70s°F (23° to 25°C). Filtration is best accomplished with air-driven box and/or sponge filters or small power filters. Excessive water flow is to be avoided, but there should be some current.

A biotope aquarium can be set up in much the same way but without the flowerpots or other synthetic caves. Plants can include *Cryptocoryne*, *Bolbitis*, *Microsorum*, and *Nymphaea* species as well as Java moss or similar other mosses.

Tankmates

Small rasbora species make the best tankmates. Their peaceful schooling behavior will encourage the bettas to feel more secure and to spend more time out in the open. When the rasboras react to potential threats, it gives the bettas an early warning so they can hide, too. If the rasboras do not sense a threat, the bettas will know that it is safe to be out and about.

Rasbora jacobsoni and *R. kluetensis* have both been collected with *B. dennisyongi*, but I have never seen either of these species offered in the trade, so other rasbora species will have to suffice. The glass catfish (*Kryptopterus piperatus*) has also been collected with *B. dennisyongi,* so glass catfish might be an interesting option for the hobbyist, although they


Richard Brode

A female *B. rubra* holds the fertilized eggs with her pectoral fins.

will certainly predate any fry. The loach *Nemacheilus tuberigum* is also sympatric with *B. dennisyongi*, making some loaches an excellent choice if a bottom dweller is desired. In addition to *Nemacheilus* species, *Acanthophthalmus* species work particularly well, though other smaller loaches can also be added quite successfully.

Bettas will still spawn in such a setup, but the males will not be as likely to hold the eggs and fry to term. If left to their own devices in a biotope setup, few if any of the fry will survive, as any fish with a mouth large enough to eat them will view them as tasty morsels.

Breeding

Spawning proceeds in typical betta fashion, with the male wrapping the female in an embrace. The female picks up the fertilized eggs and passes them to the male. The male will typically brood the eggs and fry for 13 to 16 days, though this can vary, and reports range from 10 to 17 days.

The fry are large enough to accept newly hatched baby brine shrimp when the male releases them. The presence of leaf litter and a big clump of Java moss in the brooding tank will also provide a wide array of micro fauna on which the fry can feed. It usually takes the males a few attempts before they will brood the eggs and fry successfully.

Males can be left in the species tank. To maximize the number of survivors, the female can be removed from the tank at about the tenth day, or the male can be moved to a brooding tank between the eighth and tenth day. If the male is to be moved, it is better to catch him in a clear plastic container, so that he can remain submerged throughout the process.

If the brooding tank is in a quiet area where he will not be disturbed by a lot of shadows and movement outside the tank, the male will be more likely to brood to term. The male should be fed heavily for a few weeks before he goes back in with the female, so that he can replenish his reserves prior to spawning again. Males don't eat while brooding, so breeding several times in a row without time to eat, recover, and prepare to spawn again will seriously compromise the male's health and significantly shorten his lifespan.

The next time you're looking for a very colorful species to work with, consider a pair of *rubra* complex bettas. You may be able to help these species survive, and their color and behavior will generously reward your efforts.

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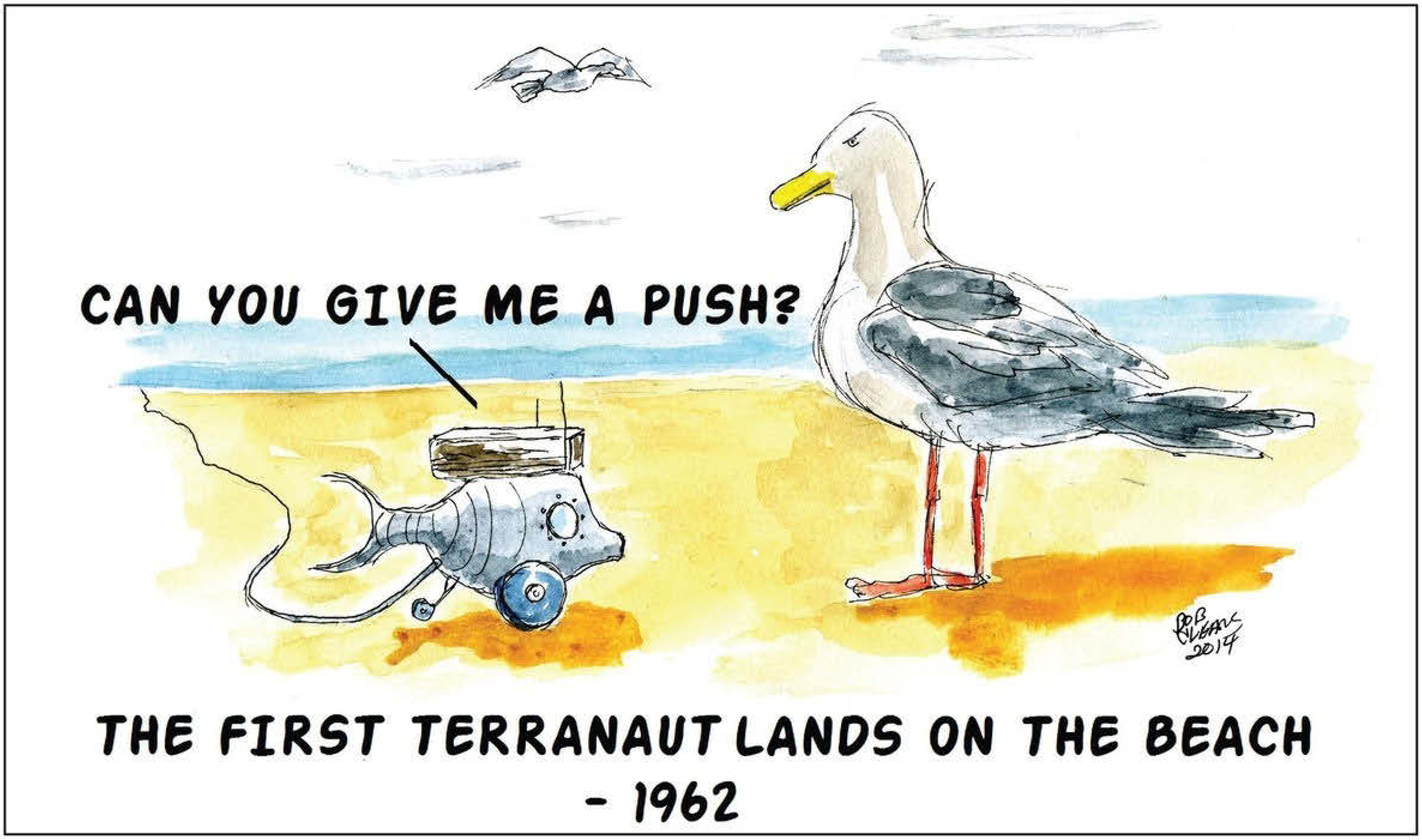
Tan, H. H., 2013. "The Identity of *Betta rubra* (Teleostei: Osphronemidae) revisited, with description of a new species from Sumatra, Indonesia." *The Raffles Bulletin of Zoology;* Vol. 61(1): 323–330.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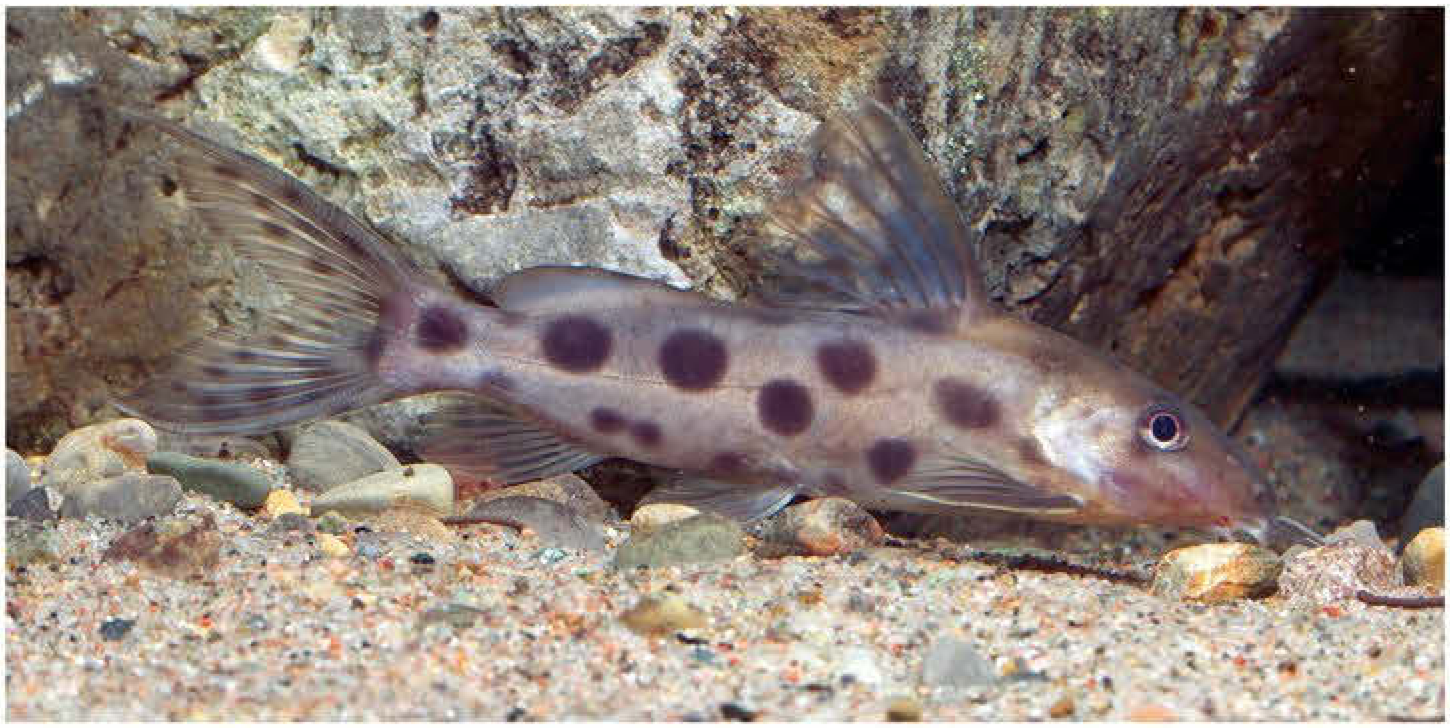


Synodontis pulcher

From: Congo River rapids

Size: up to 6 inches (15 cm)

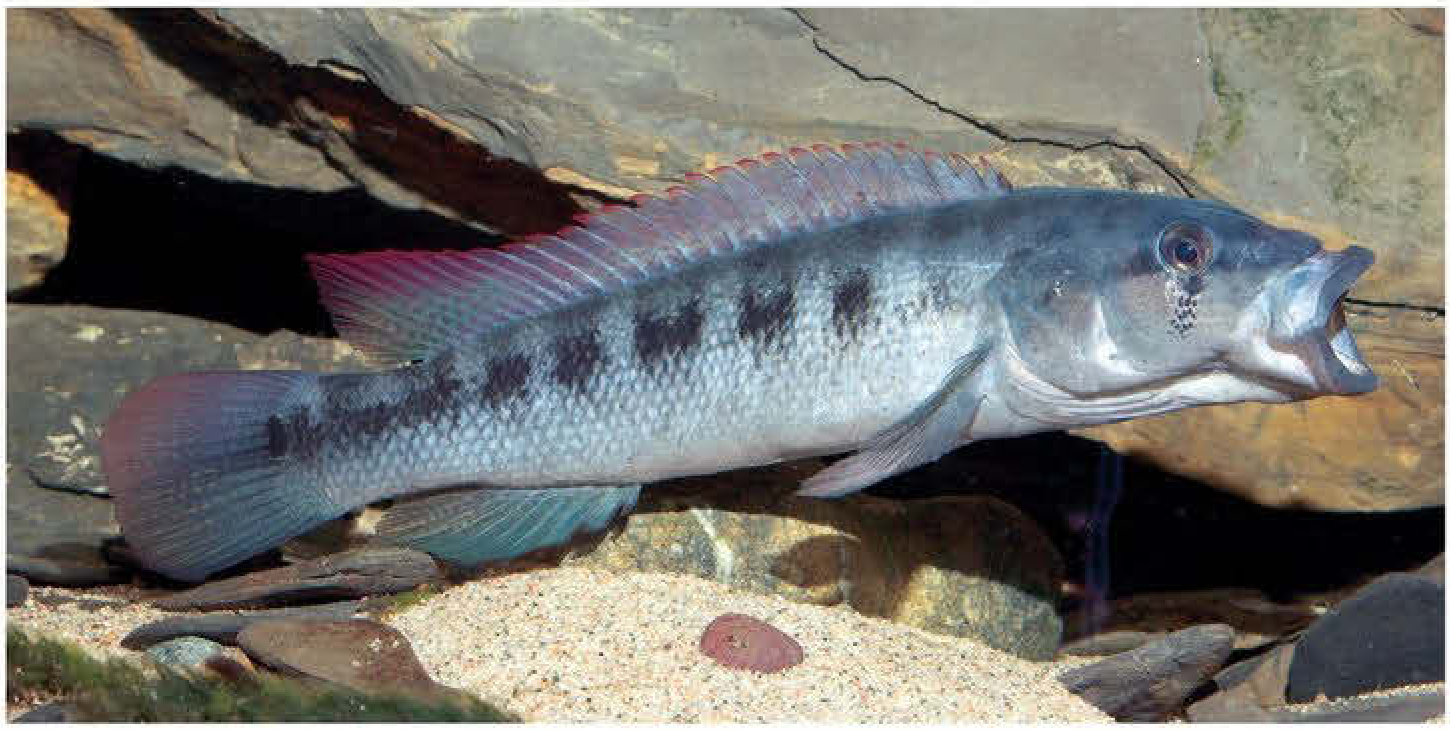
Synodontis pulcher must be either very rare in the Congo River or found in a different region, because there are no photographs of living specimens of this *Synodontis* in the wild. This super-rare species resembles *S. longirostris* in pattern but has a body shape more typical of *S. brichardi* or *S. caudalis*. Maybe we will finally get to see more of this beautiful catfish in 2015!

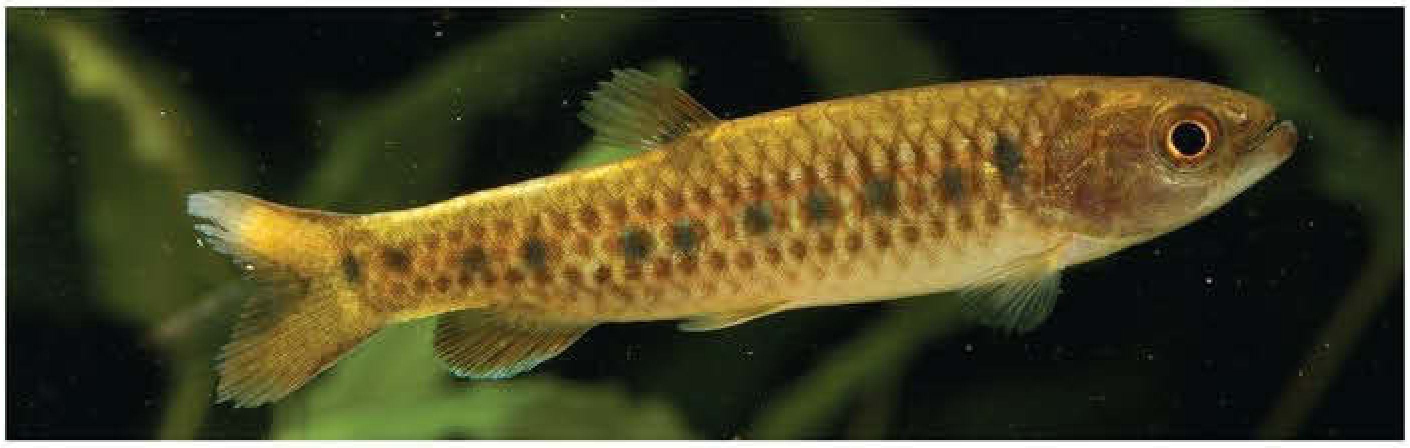
Crenicichla hu

From: Northern Argentina

Size: up to 7 inches (18 cm)

Found only in a very small habitat in Argentina's northern Missiones province, *Crenicichla hu* is a fish for specialists. These cichlids, which are hard to come by, are accordingly expensive. They are also unusually aggressive and not easy to keep with other cichlids. The fast-moving leporinus is a good choice as tankmate for *C. hu*. The species name "hu" means "black" in the local native language.





Lebiasina multimaculata

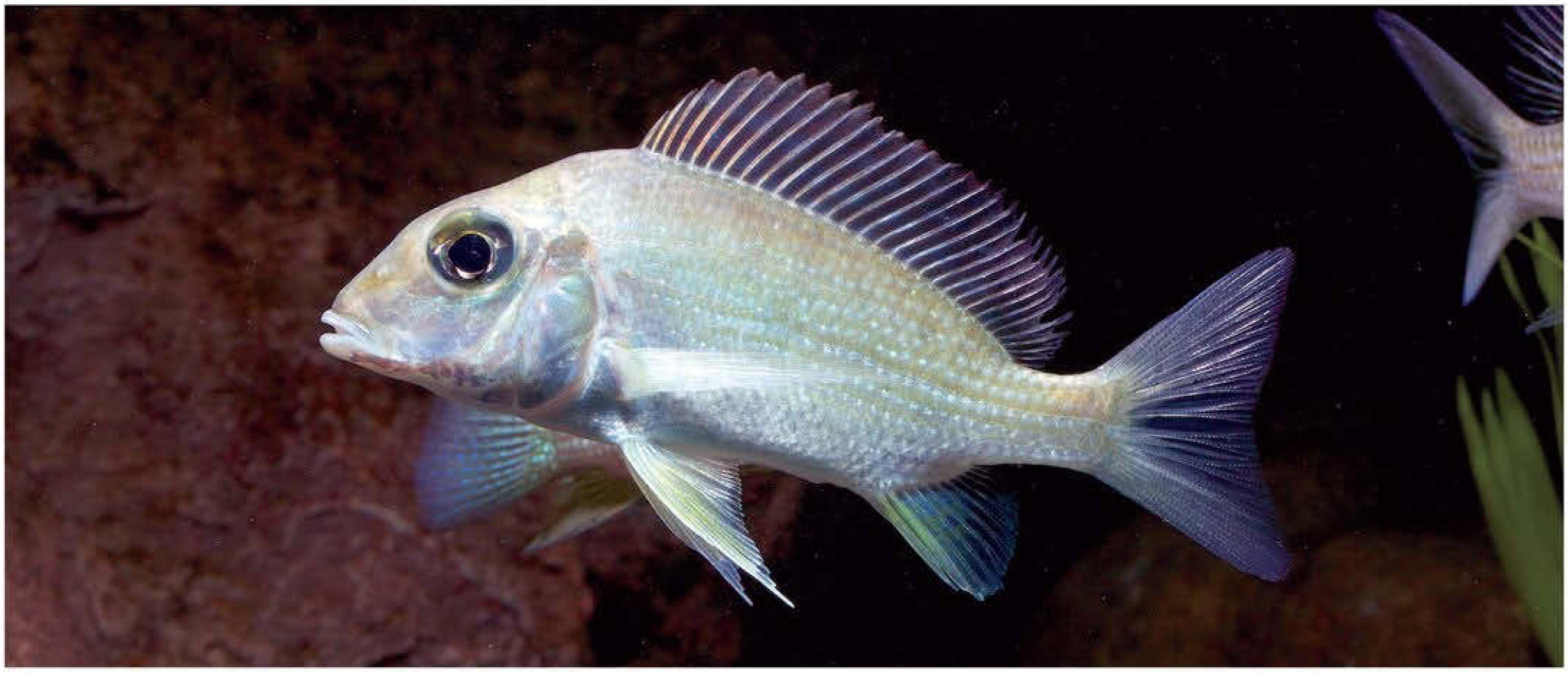
From: Choco Province, Colombia • **Size:** up to 8 inches (20 cm)

The multi-spotted *Lebiasina multimaculata* is the most colorful species in the genus and really stands out with its turquoise and orange markings when it reaches adulthood. Unfortunately, this fish is also unusually aggressive toward conspecifics, even to the point where keeping juveniles in the same aquarium becomes a difficult endeavor. Breeding this fish must be the ultimate challenge for expert aquarists.

Oliver Lucanus has been fascinated with aquatic life since early childhood. He has been a full time aquarist and owner of Below Water in Canada for over 25 years, importing fishes from around the world. His main interest is fish in their natural habitat and he has made many expeditions to see the fish in their environment. He has published many articles and several books on fish and expeditions. His book "The Amazon Below Water" shows many popular aquarium species in nature.

oliver lucanus

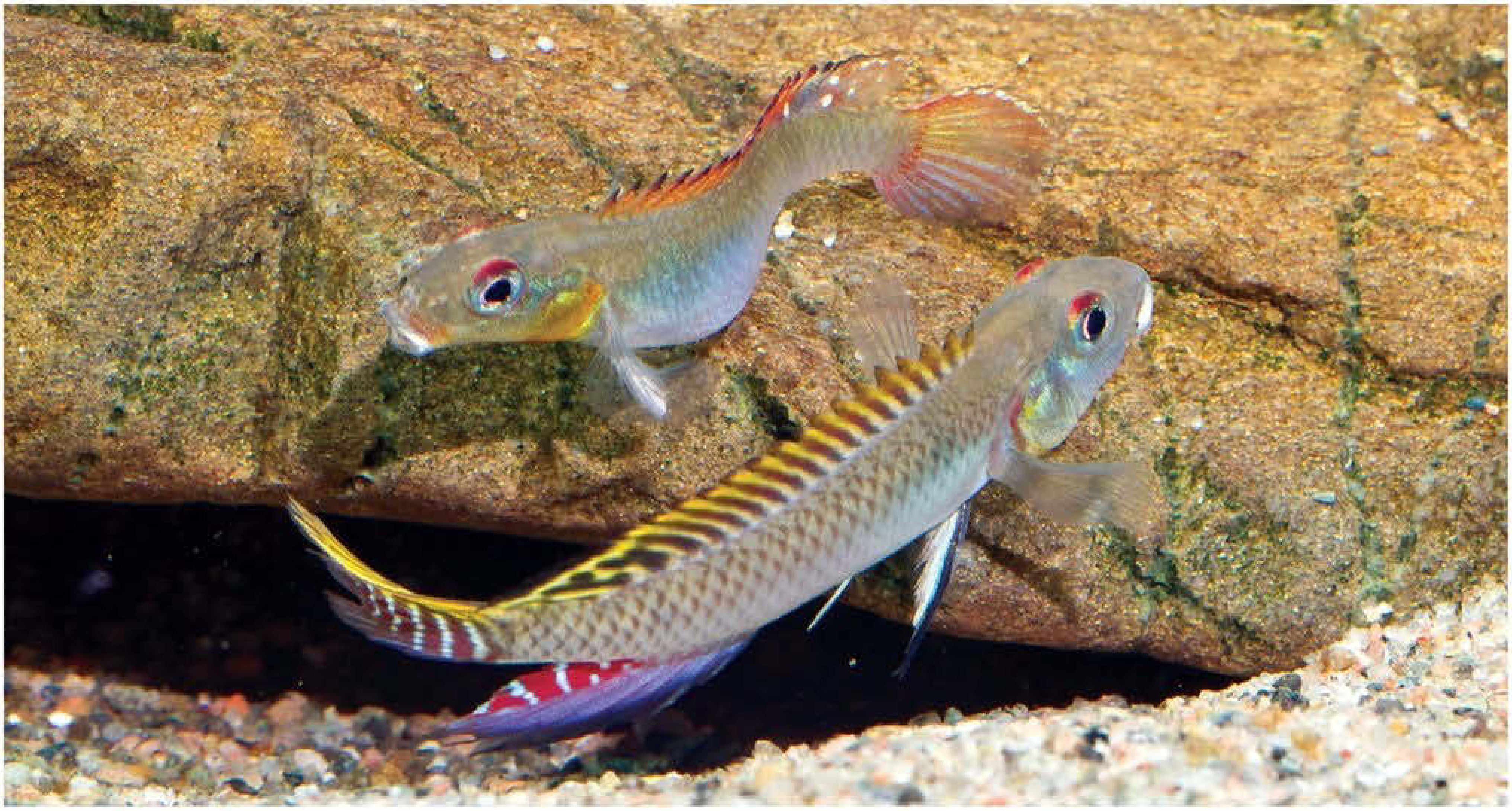
photographs by the author



Tylochromis intermedius

From: Kolente River, Guinea • **Size:** up to 8 inches (20 cm)

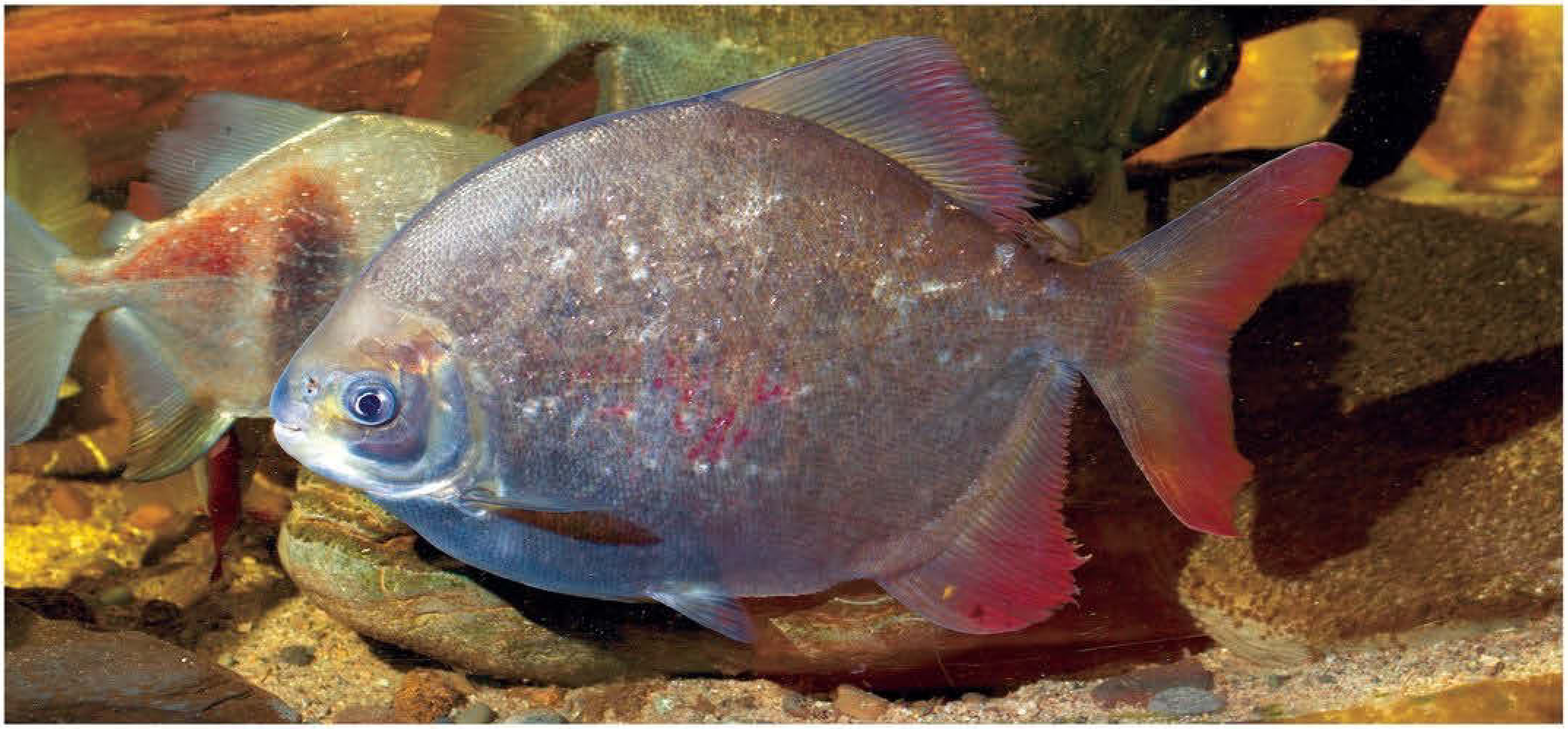
The genus *Tylochromis* is the great unknown in the cichlid world. There are 18 described species, yet there are almost no color photographs nor are they easy to distinguish from live specimens. Very few species have been kept in the aquarium or bred in captivity. Found in West Africa, *T. intermedius* is like all species in the genus in that it grows very slowly and requires a large aquarium with frequent water changes.



Nanochromis splendens

From: Congo River near Kinganga • **Size:** up to 2 inches (5 cm)

Nanochromis splendens may well be the nicest "West" African dwarf cichlid. This colorful species is smaller than other *Nanochromis* and is not too difficult to breed. Its habitat is unfortunately restricted to the lower Congo River and is a great distance from Kinshasa, which is the main reason we have seen few specimens exported until recently. The more slender body makes it easy to distinguish from other *Nanochromis*.



Myleus micans

From: Rio Sao Francisco, Brazil • **Size:** up to 15 inches (38 cm)

Myleus micans is one of the larger species of its genus, is rarely exported, and requires a very large aquarium. Females have bright red fins, while males are more oxblood-colored, with a dozen filaments on the rays of their dorsal fin. An aquarium of 300 gallons (1140 liters) or more is needed to keep a group of these massive silver dollars.

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the salt mix

Two Tangs from the Atlantic and Caribbean

james fatherree

photographs by the author

James Fatherree, MSc, is a physical and environmental sciences professor in Tampa, Florida. He has been an aquarium hobbyist since childhood, a reef aquarium hobbyist for over 20 years, and has spent many days diving in Florida, Hawaii, the Bahamas, Japan, and Indonesia. In the past he has managed a large retail aquarium store, owned and operated an aquarium design, installation, and maintenance business, and spent a summer working for an aquarium livestock collector/wholesaler in Florida. James has also published numerous articles in the U.S. and Europe, and has written and illustrated several books on the topics of reef organisms and marine aquariums, the latest of which is Giant Clams in the Sea and the Aquarium.

The vast majority of fish available to aquarium hobbyists are collected in the tropical western Pacific Ocean, but a few come from the Atlantic Ocean and Caribbean Sea. Among these are a couple of tangs, also known as surgeonfishes, which can be good additions to fish and reef aquariums.

This month, we will examine some basic information about tangs and take a closer look at these two fishes, which are commonly known as the Atlantic blue tang (*Acanthurus coeruleus*) and the ocean surgeonfish (*A. bahianus*).

Acanthuridae

To start, all tangs belong to one taxonomic group, the family Acanthuridae, and share some features that make them distinct from other sorts of fishes. The most noticeable of these is the blade-like structure found near the tail. This varies in size and is present on both sides of the base of the tail. There may be a pair on each side in some species, as well. Some can also fold in, flush with the body—like little switchblade knives—while others are permanently fixed in the out and open position.

If you ever put two incompatible individuals together, you'll quickly find out how tangs utilize these blades. Rather than nibbling or biting each other like many fish will do, tangs will slap each other repeatedly with their tail, utilizing their little scalpels. Thus, they can stick each other and may even cut each other as they squabble.

However, it typically doesn't go any further than that, and the trauma inflicted is rarely life threatening. Of course, the presence of these blades and this kind of fighting is why the tangs are also called surgeonfishes.

However, don't be fooled by their possession of weapons. Tangs, in general, are very personable and intelligent, and many species are some of the most desirable fish you can keep. When it comes down to it, when kept with appropriate tankmates, tangs are my personal favorites—they're also almost always reef-safe.

Let's take a look at the two species from the Atlantic and Caribbean that you may come across, which are no exceptions.

The Atlantic Blue Tang

The Atlantic blue tang (*A. coeruleus*) is the "other" blue tang seen in the hobby, as there's also the Pacific blue tang (*Paracanthurus hepatus*), which is sometimes called the palette surgeonfish and is found on the other side of the planet. The two blue tangs aren't closely related within the family Acanthuridae either and wouldn't visually be mistaken for each other.

The Atlantic blue tang can be found in the tropical western Atlantic from the US East Coast all the way down to Brazil and is also found throughout the Caribbean and in the Gulf of Mexico. It can also get pretty big, as fishbase.org reports that the maximum reported length is a little over 15 inches (38 cm). That's the record holder, however, and most of them won't grow any longer than about 10 inches (25 cm). That's still a big fish, of course, and these should be kept in an appropriately sized tank.

COLOR VARIATION

One of the most notable things about this species is the range of colors individuals can come in. While adults are typically a nice medium-blue color with lots of blue stripes, juveniles are bright yellow. When young, they're almost completely yellow, with the exception of some blue to blue-green trim on their dorsal and anal fins and a matching ring around their eyes. Depending on the individual, once one grows to a size of somewhere around 3 to 5 inches (7.5 to 13 cm), all that will start to change.

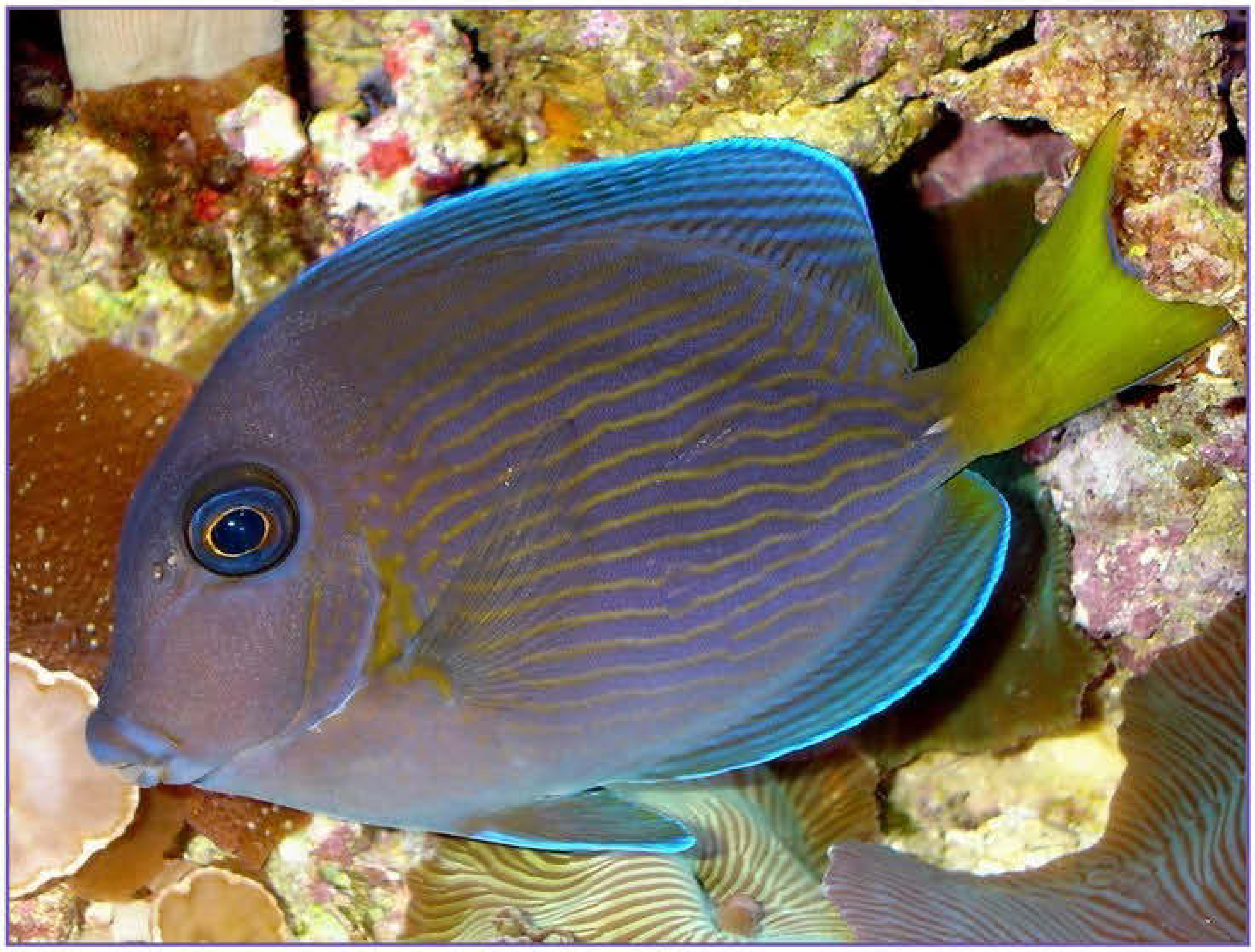
As the Atlantic blue tangs mature, their body color begins to turn from yellow to blue, with the tail fin being the last part to change. In this transitional state, they often turn sort of blue-gray and may have thin yellow stripes running down their body once they've transitioned to blue.

You can find them in yellow, blue-gray to blue with a yellow tail and maybe some stripes, all blue, or anything in between, although most of the ones that I see for sale are in the transitional state, with the blue body and yellow tail.

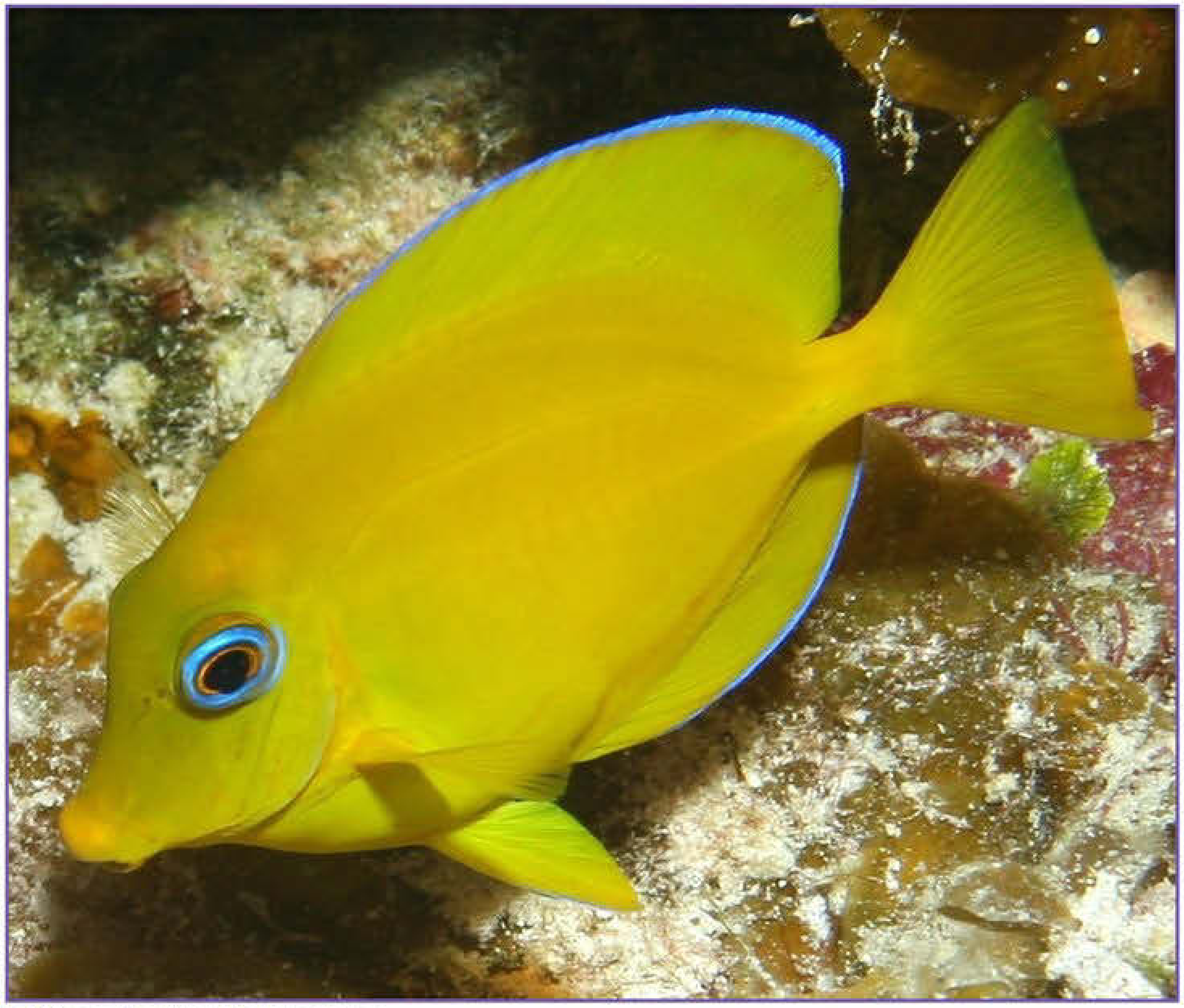
Note that even when they're all blue, their color can be variable, as well. While they're usually medium blue, depending on variables such as mood and condition, this fish can go from baby blue to navy blue and all shades in between. Oddly enough, I've seen shoals of them in the Bahamas containing a mix of light, medium, and dark.

TANKMATES

When it comes to compatibilities in the aquarium, individuals of this species typically get along fine with anything that's not a tang. While tangs typically move about in shoals in the wild, some Atlantic blue tangs live alone and can become quite territorial. Juveniles live solitary lives and are especially territorial, too. Trying to keep more than one of these in one tank will usually lead to fighting, as will trying to keep one with any other type of tang. While sparring with bladed tails isn't severe in rare occurrences, nonstop bickering between two individuals usually leads to one of the fish dying off. In confined spaces



■ A maturing Atlantic blue tang (*Acanthurus coeruleus*) with a yellow tail.



■ A juvenile Atlantic blue tang.

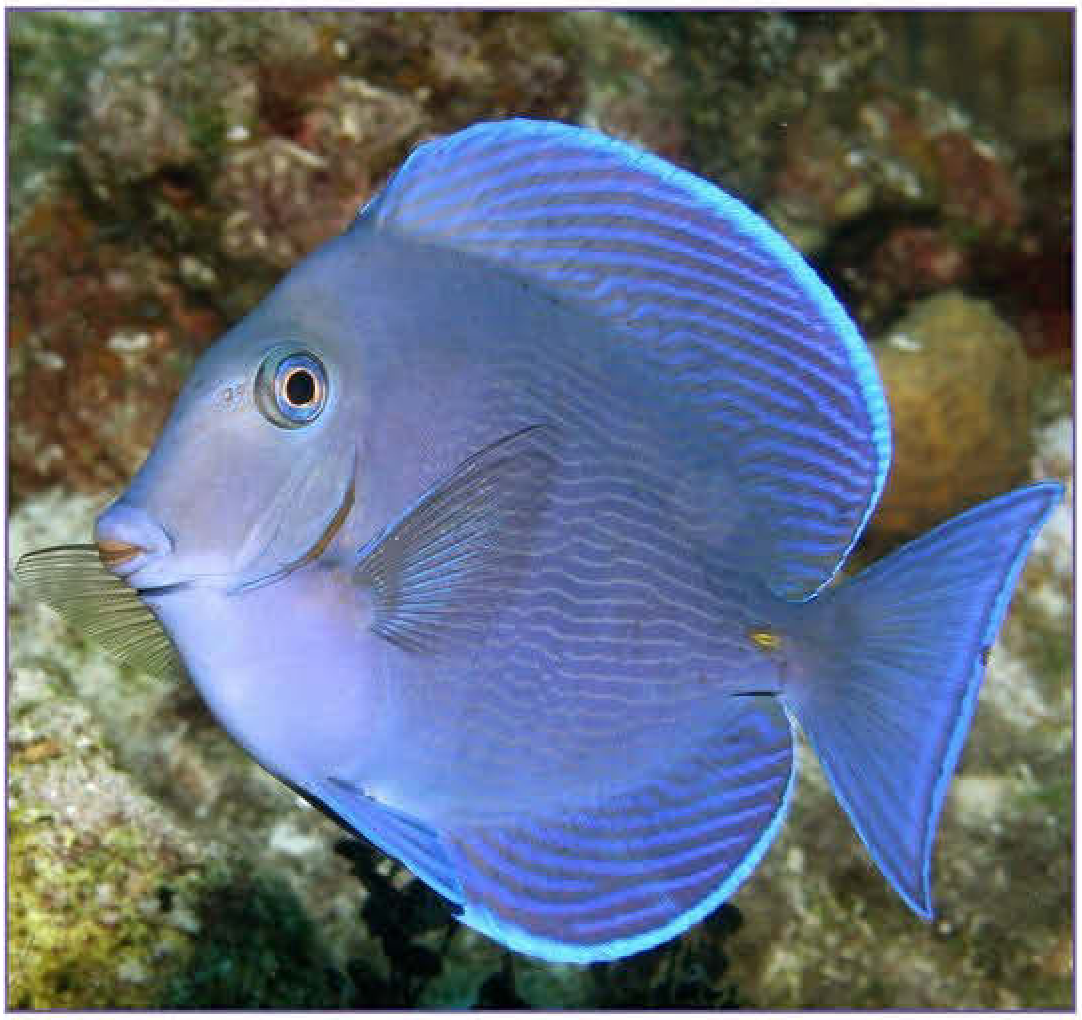
such as aquariums, two tangs see each other as competition for limited resources, which leads to highly dominant and aggressive behavior.

However, if the tank is big enough and several individuals of similar size are added simultaneously, their schooling nature sometimes overrides their territorial aggression toward each other, and they may get along fine. In general, you'd need to add at least four or five at once, and again, you'd need a very large tank. In other words, the vast majority of hobbyists should plan on having just one of these and no other tangs.

FEEDING

Atlantic blue tangs are strictly herbivorous grazers in the wild. However, they typically learn to eat meaty foods when kept in captivity, eagerly taking a wide variety of foods, including various types of zooplankton, brine shrimp, and bits of fish, clam, etc. I've fed them many types of flake foods and veggies from the grocery store, too. So you can feed them quite an assortment of foods in an aquarium.

Still, it's very important that you give them plenty of plant matter in their diet, which may be primarily plant-based flake, pellet, or frozen cube foods if you prefer. Spirulina flakes are also good, as is dried seaweed (nori and kombu). If you use the latter, be sure to buy unseasoned/untreated types, as you don't want to give your fishes any sorts of additives, preservatives, etc.

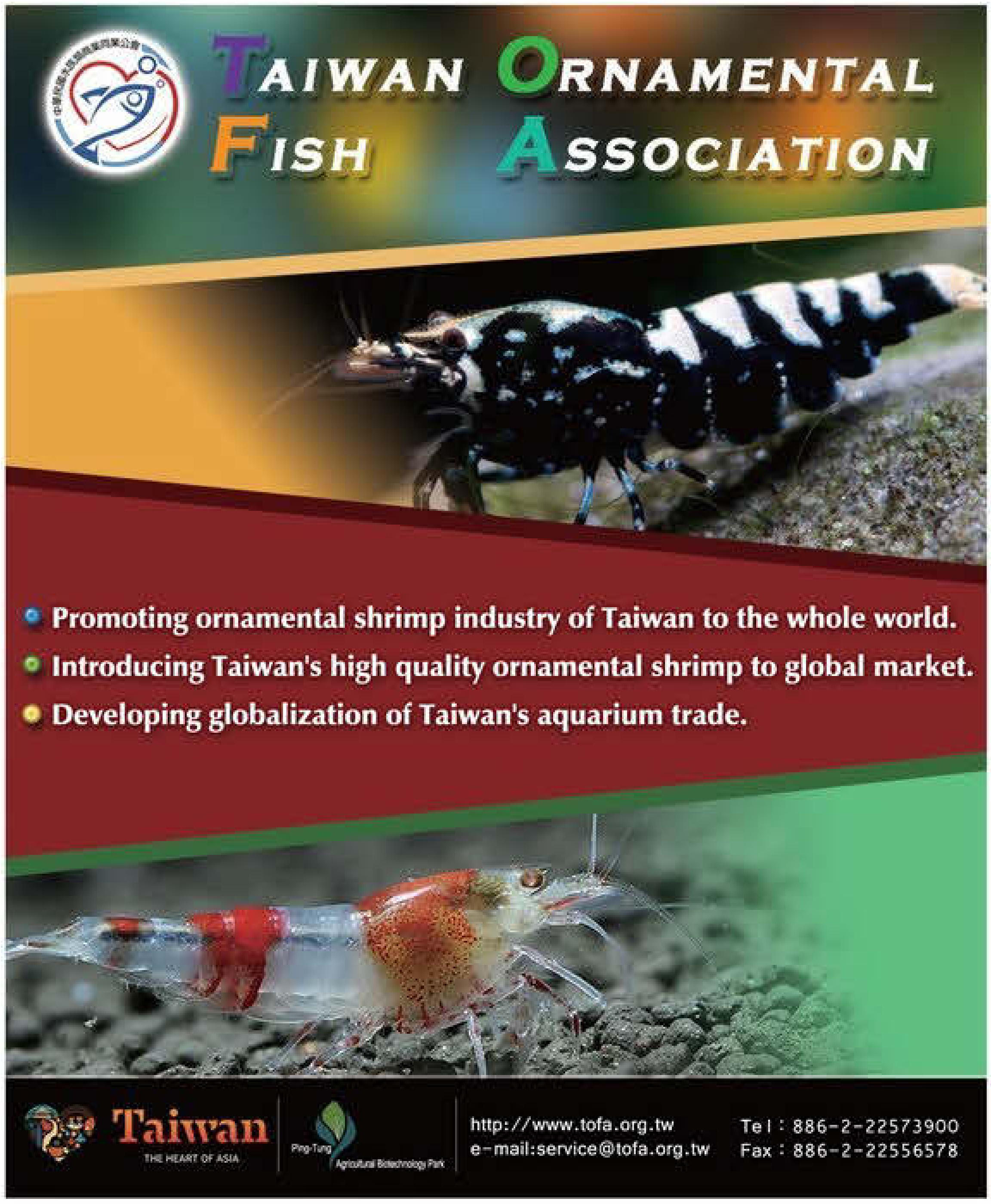


An adult Atlantic blue tang flares its fins for the camera.

Of course, the meaty things can be used as supplements, which the fishes seem to enjoy quite a lot for being considered herbivores. Being good cleaners, they'll get some of their own food by picking at algae growing on rocks and such in aquariums. Regardless, be sure they get enough food to stay nice and thick, as a wafer-thin body and pinched-in stomach are bad signs.

Also remember that while these are considered to be a reef-safe species, they have been known to nip at large-polyp stony corals if underfed. During routine grazing behavior, sometimes a tang will nip a coral, causing it to close up. As long as this is simply a mistake on the part of the fish, it shouldn't lead to long-term health problems in corals.

Last, and still on the subject of feeding, grazers like these tend to nibble and eat all day. This is especially true for the juveniles, which feed continuously during the day. So it's best to feed such fish small meals at least three times daily—or more—as opposed to one or two larger meals per day.



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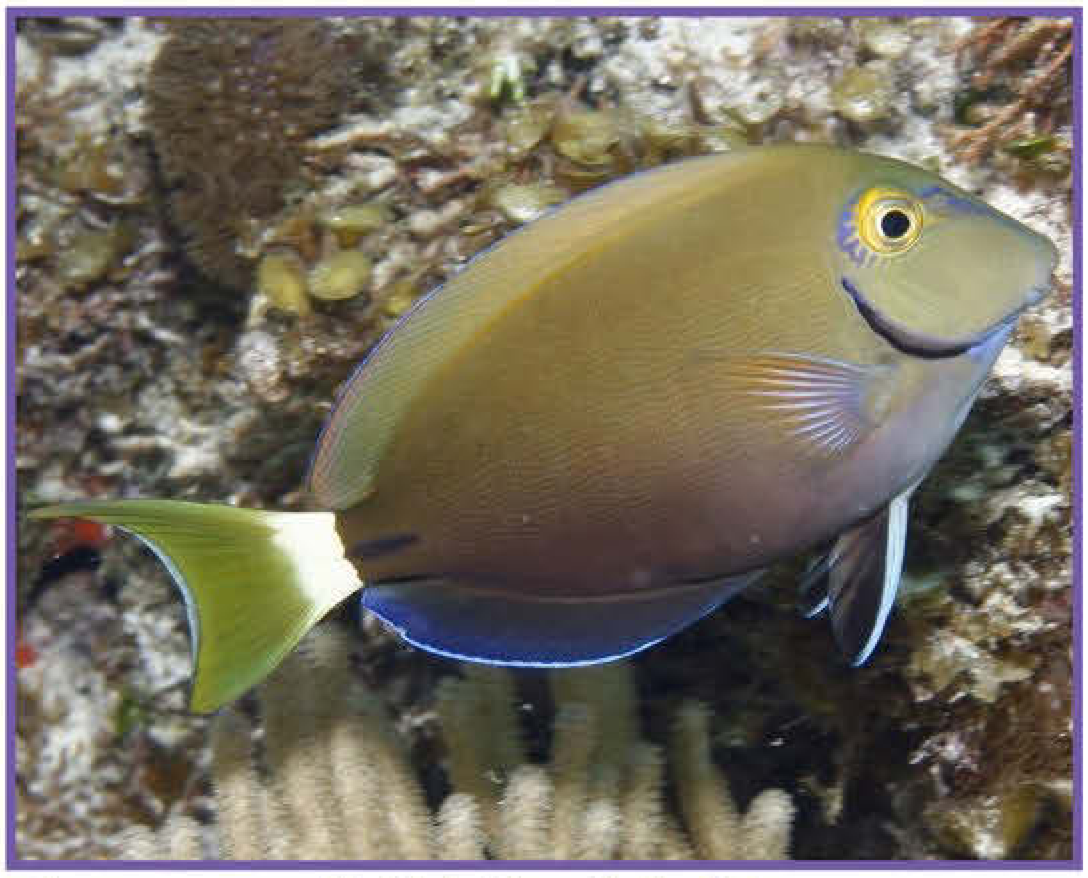
The Ocean Surgeon

The ocean surgeon (*A. bahianus*) isn't offered nearly as often as is the Atlantic blue tang, but I see it here and there at shops and aquariums. Regardless, this species can also be found throughout the Caribbean and in the tropical western Atlantic from the East Coast of the US down to Brazil and in the Gulf of Mexico. However, unlike the Atlantic blue tang, it also lives in the tropical eastern Atlantic around the Ascension and St. Helena islands and off Angola.

APPEARANCE

It can get pretty big too, as fishbase.org reports that the maximum reported length is right at 15 inches (38 cm). As was the case with the Atlantic blue tang, that size is the record holder, and most ocean surgeons won't grow any longer than about 10 inches (25 cm).

I'm guessing that one of the reasons these aren't offered with the same frequency as the Atlantic blue tang is that it isn't a nice blue or yellow color (or red, green, or purple, for that matter). Instead, this fish is bluish-gray to dark brown. Most individuals have some blue or white trim on their fins and some other markings here and



An ocean surgeonfish (*A. bahianus*) in the Bahamas.

there, and they often have a light band around the base of their tail that still makes this an attractive fish in its own way (at least it is to me).

DIET AND TANKMATES

As with the Atlantic blue tang, this species is a full-time grazing herbivore, and it tends to travel in shoals most of the time. In fact, it's not uncommon to see half a dozen or more moving about the reef in a mixed group with Atlantic blue tangs. No, that does not mean you can keep one of each together in an aquarium. Things are different in the ocean.

When it comes down to it, with respect to compatibilities, for the most part, everything is pretty much the same as above. Ocean surgeons are generally not territorial or aggressive and typically get along fine with any fishes that aren't other oceanic surgeons or some other kind of tang. And, in a very large aquarium, it is possible to keep a group of them, as in four or five or more. Again, these should all be added at the same time and at the same size for the best odds of success. As mentioned before, a very large aquarium is required, with 300 gallons (1135 liters) being questionable for a shoal of tangs.

Likewise, oceanic surgeons will also eat a wide range of foods but need lots of plant matter in their diet in order to thrive. Be sure to feed them as you would the Atlantic blue tang, making sure to provide something to eat at least a few times per day. Again, this is considered to be a species suitable for life in a reef aquarium, but like many other herbivorous fishes, these may nip at some corals if underfed.

It's worth mentioning that some aquarium purists don't like to mix species from the Caribbean with those that originate in the Pacific. There is no harm in doing so, as long as the species are compatible. That said, two tangs together, regardless of oceanic origin, are likely to fight to the point of either one fish being removed or one ending up badly hurt or killed. Just because two species don't exist together in nature, they will still see each other as resource competition in the aquarium.

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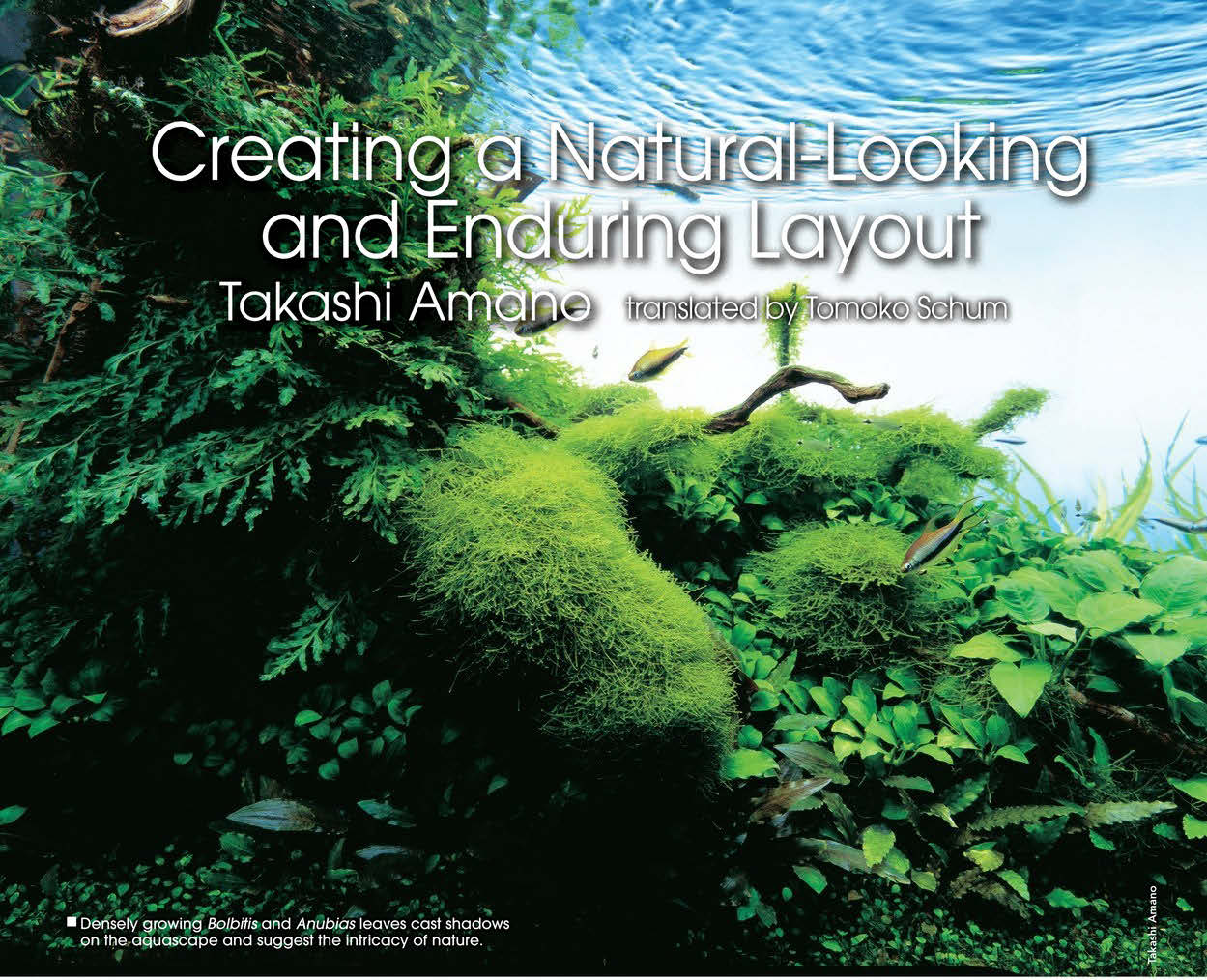
Creating a Natural-Looking and Enduring Layout

Takashi Amano translated by Tomoko Schum



■ Densely growing *Bolbitis* and *Anubias* leaves cast shadows on the aquascape and suggest the intricacy of nature.

Takashi Amano

There are no specific rules for enjoying an aquatic plant layout. However, as evidenced by the entries submitted to the International Aquatic Plants Layout Contest each year, the art form of creating aquatic plant layouts continues to grow in popularity.

The basic principles of the Nature Aquarium layout method involve the use of natural stones and driftwood, as composition materials to create a layout where aquatic plants and fish coexist without appearing unusual, and which can also be maintained for a long period of time. Many techniques are used to produce an aquascape based on these principles of the Nature Aquarium style.

Appropriate Driftwood and Plants

For example, stones are used to secure driftwood, and this becomes the framework of a composition and keeps it from falling over. I prefer to use stable driftwood that is less likely to fall over instead of the kind with many branches. I also place appropriate types of aquatic plants in strategic places to render a natural feel and enable an aquascape to be maintained long-term.

I would not produce an unnecessarily intricate layout crafted in the style of a diorama. Even if a powerful composition were created using driftwood along with an intricate aquascape produced with white cosmetic sand and aquatic plants, we cannot call it a Nature Aquarium layout unless the aquascape can be maintained over time.

The Substrate

For maintaining an aquascape, special techniques are used for building the substrate. The substrate cannot be replaced in a Nature Aquarium layout while an aquascape is being maintained. Therefore, it must be produced very carefully, especially for a large aquarium, and is often created with the idea of maintaining it for the duration.

One of the major reasons for the failure to maintain an aquascape over a long period is the poor condition of the substrate, which results in difficulty growing aquatic plants

and outbreaks of cyanobacteria. Such problems are often caused by excessively anaerobic conditions, resulting in a poor microbial balance.

It is important to maintain the water permeability of the substrate and encourage aquatic plants to spread their roots to its corners in order to prevent it from becoming excessively anaerobic. The well-maintained substrate provides oxygen to microorganisms residing there, and this keeps it in good condition.

Proper Steps

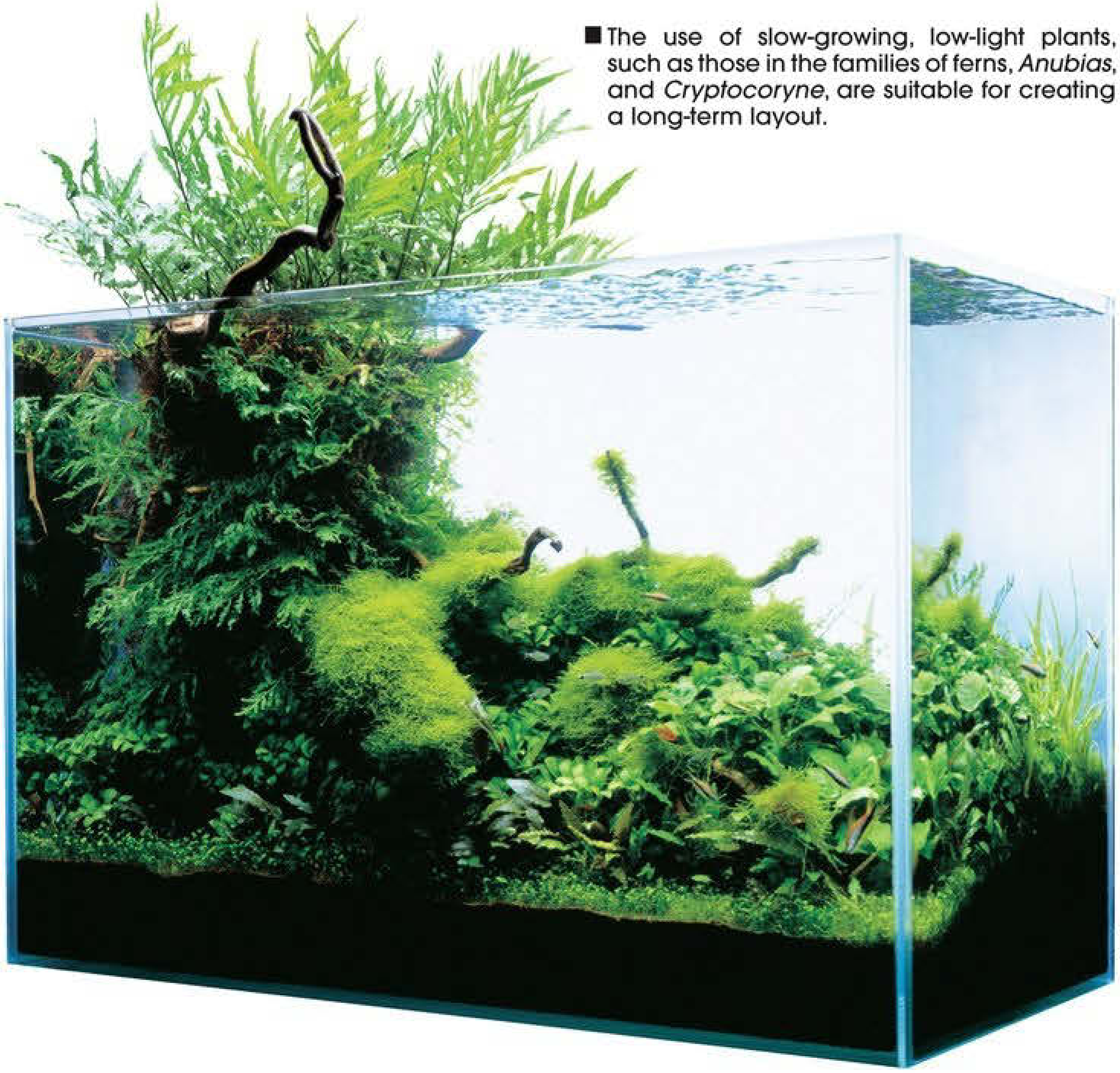
A substrate that is suitable for the long-term maintenance of an aquascape is produced in the following order: Additives are placed on the bottom of an aquarium first; then a porous, enriched volcanic-rock gravel, which has large grain sizes, is placed over the additives; and finally a dark nutritive soil, the primary substrate material, is placed on top of the enriched volcanic-rock gravel. Aquatic plants can easily spread their roots in a substrate built in this manner and should grow well due to the abundant nutrients contained in the substrate.

Next, I arrange layout materials and plant aquatic plants in the substrate. There are some techniques that will promote the long-term maintenance of an aquascape in this step as well.

First, we need to understand the characteristics of various types of aquatic plants. It is important to use heliophytic (light-loving) and sciophytic (shade-loving) aquatic plants properly according to their requirements. Heliophytic aquatic plants, such as stem plants and *Glossostigma,* require adequately strong lighting. They grow quickly and will not fail as long as their environmental requirements are met. However, they require a great deal of care, such as frequent trimming and periodic replanting, to grow well over a long period of time. On the other hand, sciophytic plants such as ferns and *Cryptocoryne* are relatively slow growing but do not require a lot of care and are quite suitable for long-term maintenance.

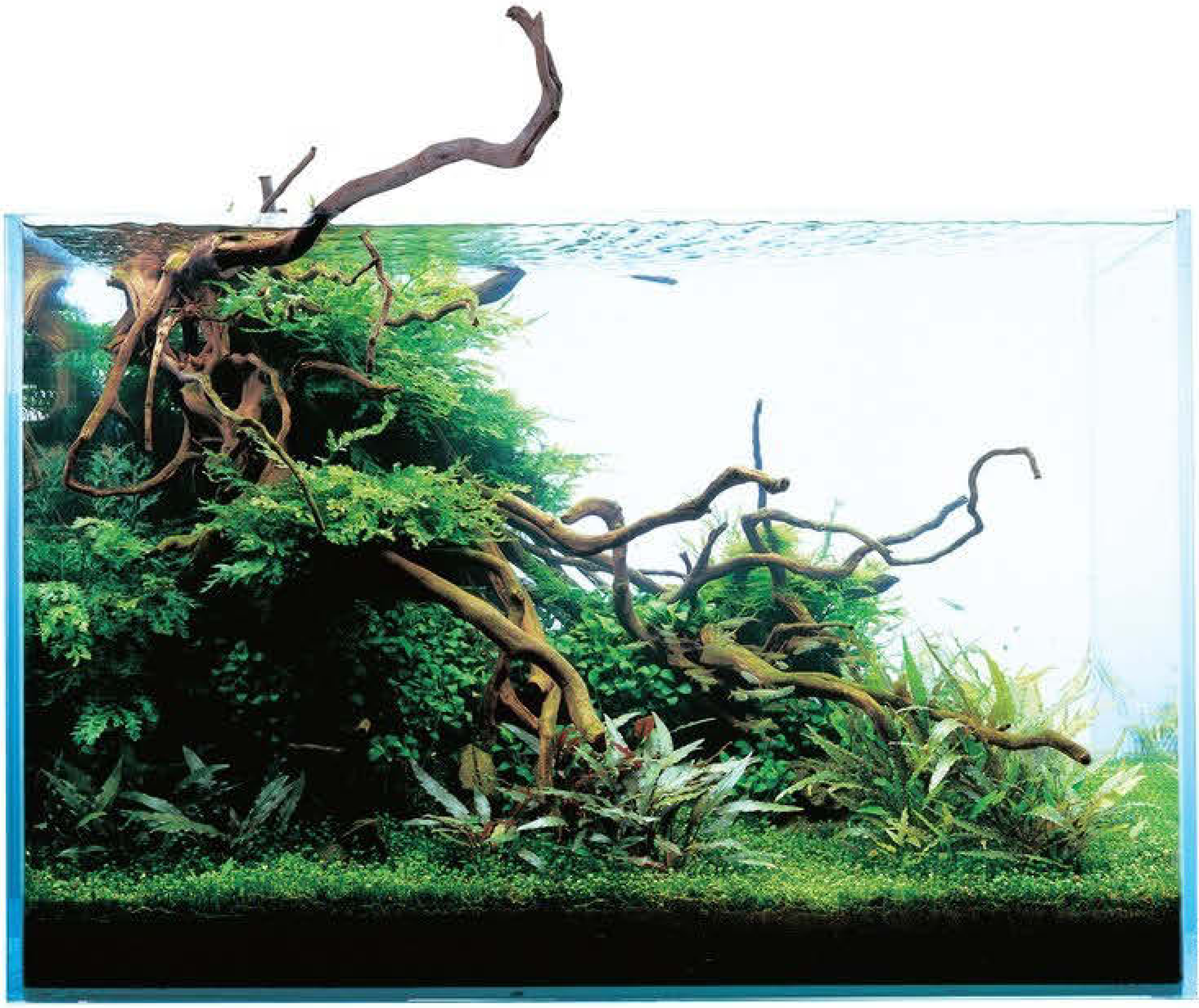
Passage of Time

The layout in this article was planted with sciophytic plants in a strategic manner so that the aquascape could be maintained easily over a long period of time. Viewers can enjoy the changes in the aquascape brought on by the passage of time.



■ The use of slow-growing, low-light plants, such as those in the families of ferns, *Anubias*, and *Cryptocoryne*, are suitable for creating a long-term layout.

Takashi Amano



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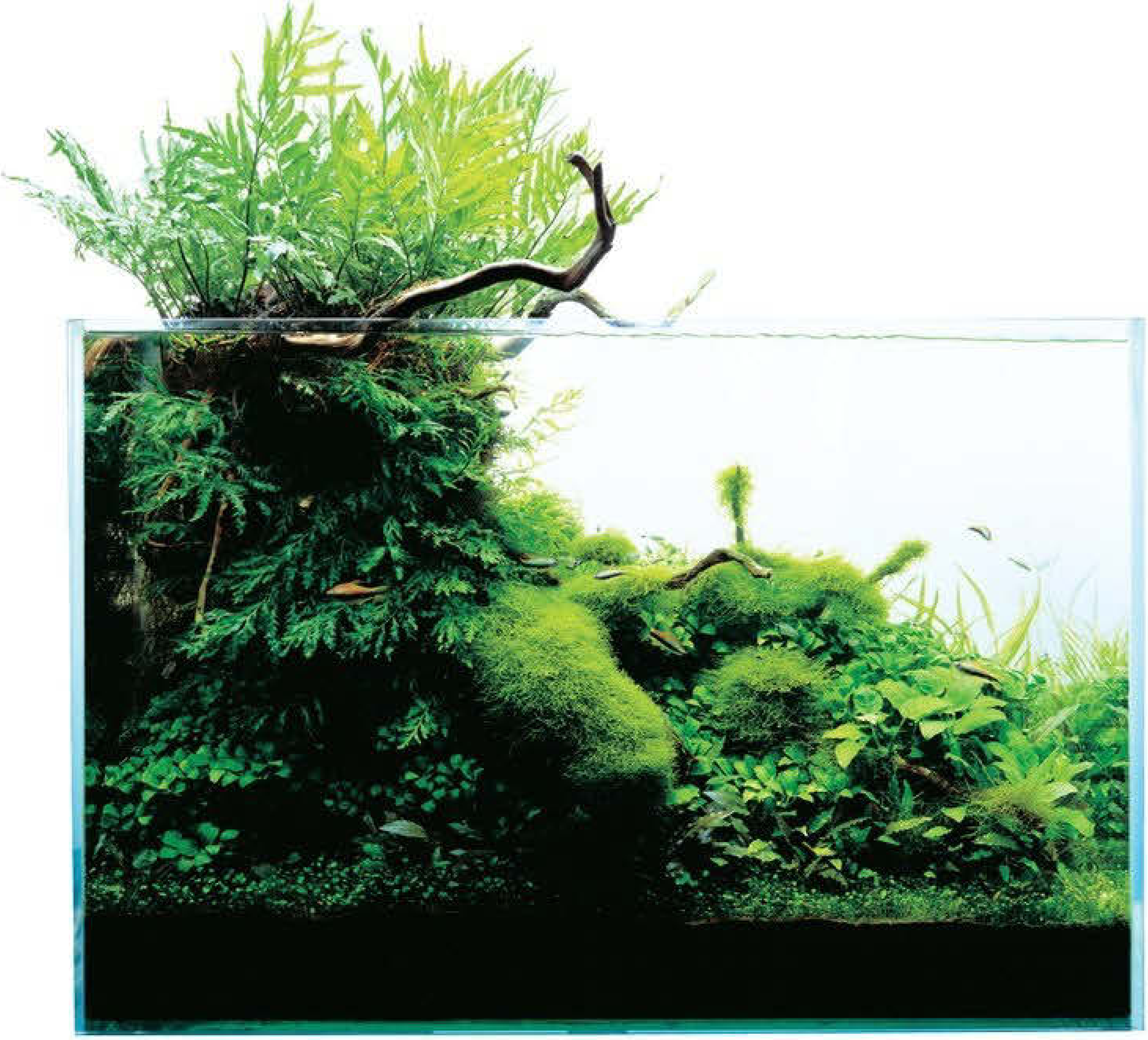
■ The appearance of the layout approximately nine months after its creation shows the twisted driftwood branches and the densely growing *Cryptocoryne* in the midground.

Ferns and mosses were grown on the driftwood, and plants of the genus *Anubias* were arranged around the stones that support the driftwood. The volume of the plants increased over time, and the aquascape became quite impressive to see. Although the amount of *Cryptocoryne* appears to have decreased, they have spread their roots throughout the substrate and kept it from deteriorating. The *Bolbitis* fern has grown large leaves above the water surface. Such large leaves are seen only in an aquascape that has been maintained for a long period of time; the emersed leaves of the slow-growing *Bolbitis* would not be so large over a short period of time.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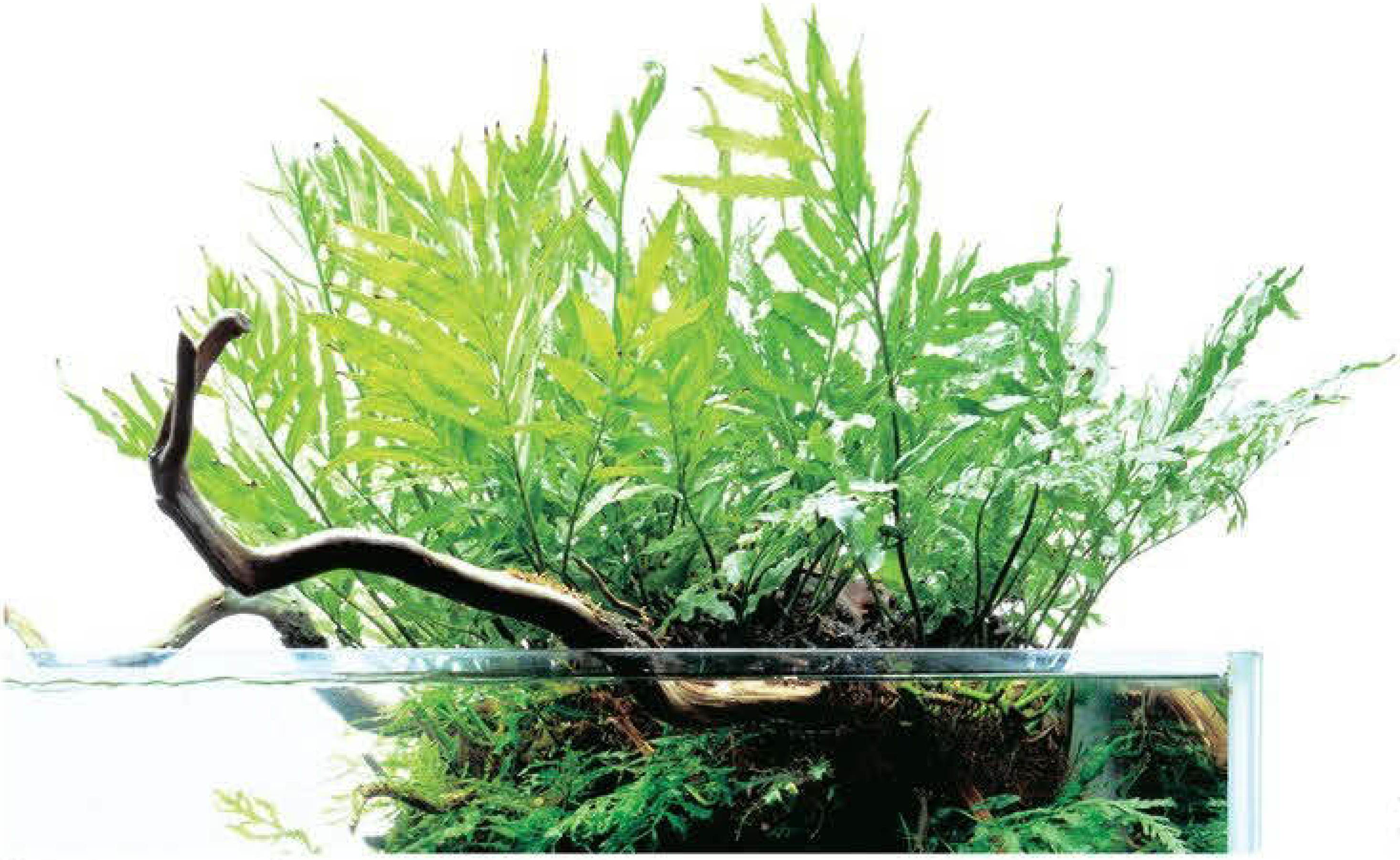
■ After four years, the leaves of the *Bolbitis* have reached above the water surface.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■ The branches of the emergent *Bolbitis* have become obscured by moss over time.

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■ Although slow-growing, the *Anubias* in the layout has become a large plant after four years.

Since a leaf of *Bolbitis* grown submersed can get too close to the glass surface of an aquarium, an overgrown leaf should be cut off at its base. However, the leaves of plants in the *Anubias* family should not be cut off even if algae is growing on them, since *Anubias* is slow to develop new leaves. Algae on the leaves of *Anubias* should be removed by adding Siamese flying foxes and/or *Otocinclus* catfish to the aquarium.

DATA

Aquarium: Cube Garden W90 x D45 x H60 cm (35 x 18 x 24 inches)

Lighting: Grand Solar I (NAG-150W-Green x 1, NA PC lamp 36W x 2), turned on for 10 hours per day

Filter: Super Jet Filter ES-1200 (Bio Rio M, NA Carbon)

Substrate: Aqua Soil Amazonia, Power Sand L, Bacter 100, Clear Super, Penac W, Penac P, Tourmaline BC

Additives: Brighty K; Green Brighty STEP2

CO_2: Pollen Glass Large 30, 3 bubbles per second via CO_2 Beetle Counter (using Tower)

Aeration: 14 hours after the light is turned off using Lily Pipe P-4

Water Change: ⅓ once a week

Water Quality: Temperature: 25°C (77°F), pH 6.8, TH 20 mg/l

Aquatic Plants: *Anubias barteri* var. nana, *Anubias barteri* var. nana "Petite," *Bolbitis heudelotii, Cryptocoryne albida, Cryptocoryne petchii, Cryptocoryne wendtii* (Green), *Marsilea crenata, Fontinalis antipyretica*

Fish/Invertebrates: *Nematobrycon palmeri, Hyphessobrycon elachys, Hyphessobrycon sweglesi, Crossocheilus oblongus, Otocinclus* sp., *Caridina multidentata*

[Note: The hardware itemized above represents the author's specific choices; equivalent results may be obtained with other equipment and accessories—Eds.]

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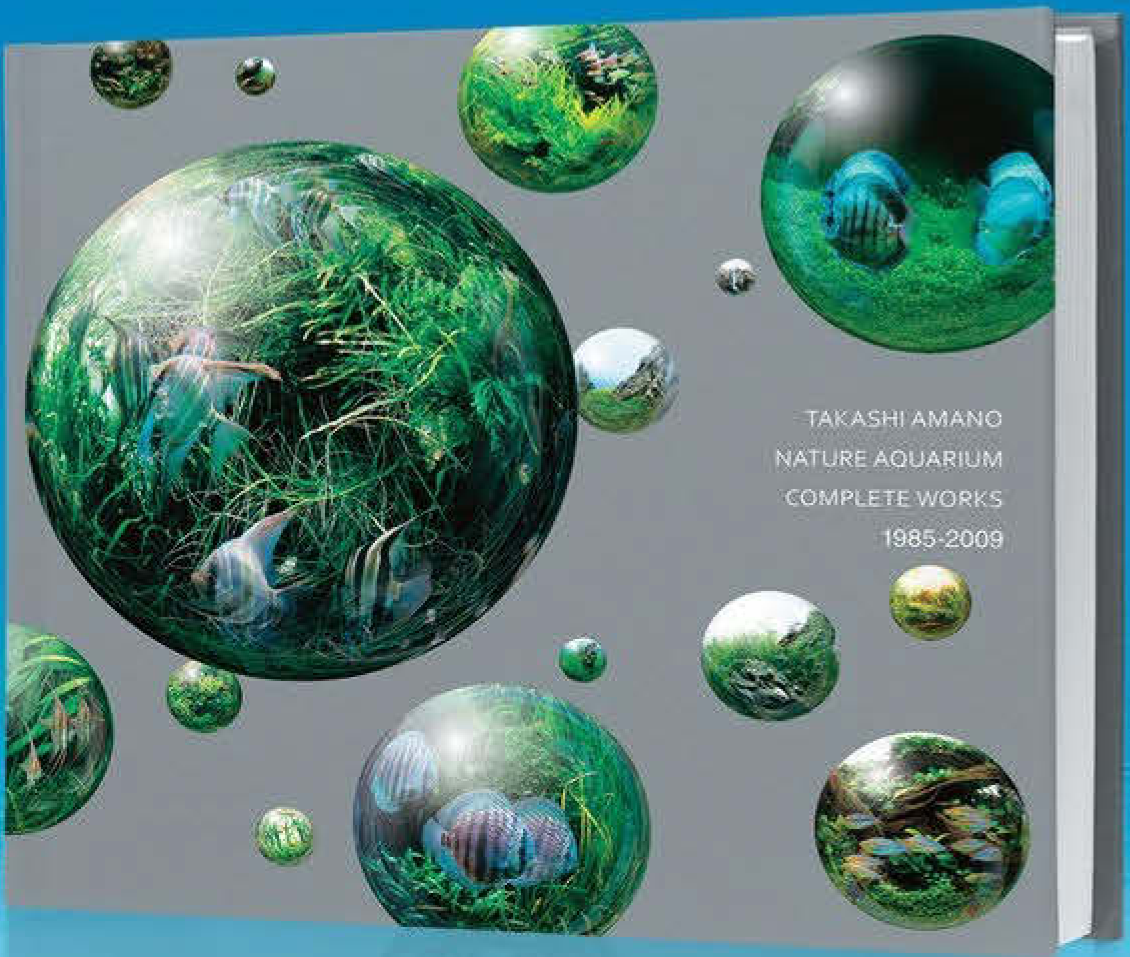
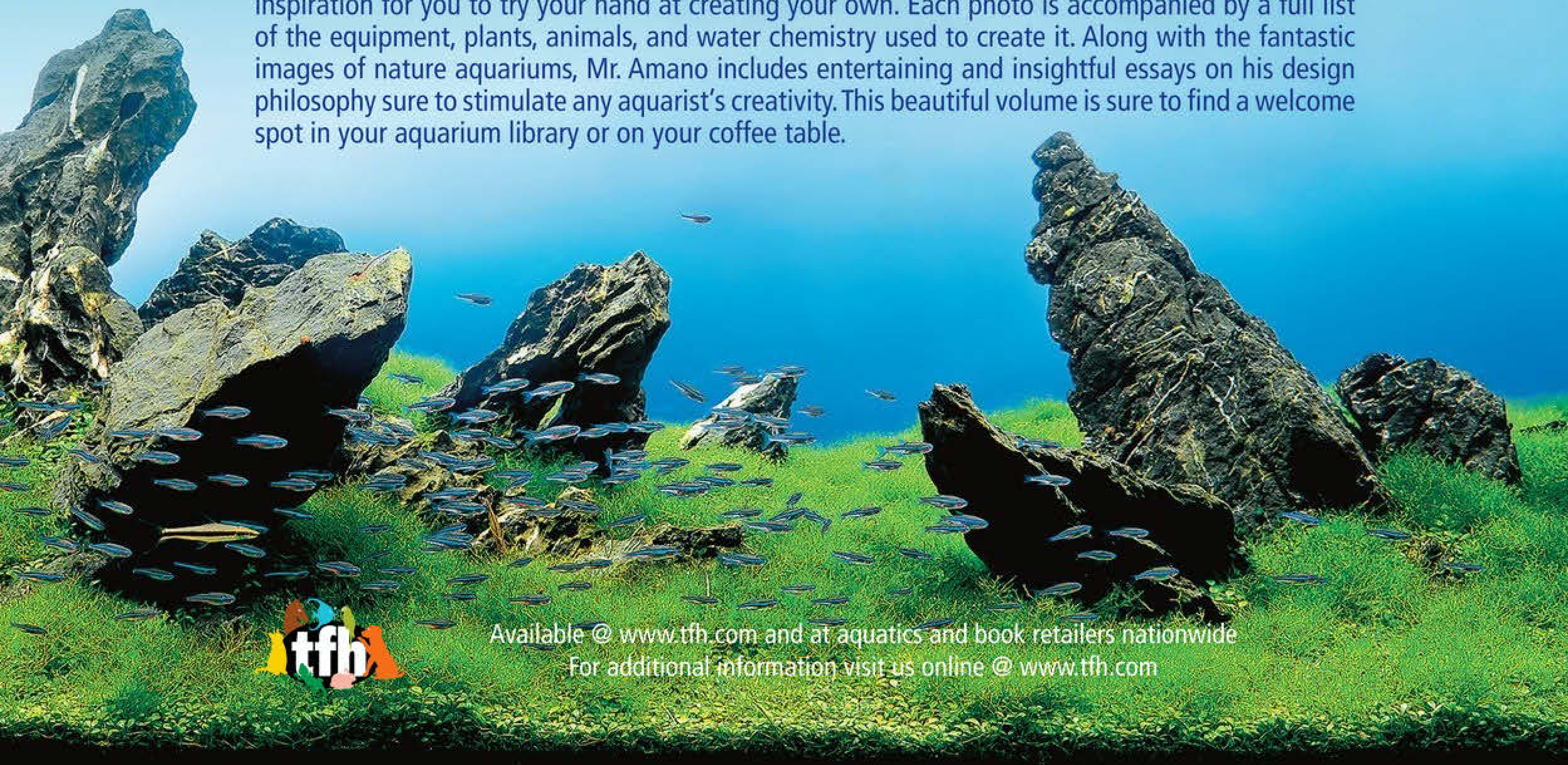


Nature Aquarium: Complete Works 1985–2009
Takashi Amano
ISBN: 9780-7938-0649-2
264 pages; hardcover
with jacket; $59.95

Nature Aquarium: Complete Works 1985–2009 showcases the spectacular designs of aquarium innovator Takashi Amano. Inside are more than 200 photos of his lush aquascapes—perfect inspiration for you to try your hand at creating your own. Each photo is accompanied by a full list of the equipment, plants, animals, and water chemistry used to create it. Along with the fantastic images of nature aquariums, Mr. Amano includes entertaining and insightful essays on his design philosophy sure to stimulate any aquarist's creativity. This beautiful volume is sure to find a welcome spot in your aquarium library or on your coffee table.



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■ *Apteronotus albifrons.*

Hristo Hristov

Chris Sergeant

Electrical Fishes:
Putting a Spark Into Fishkeeping

Finding your way around murky freshwater rivers and lakes is no mean feat, even for a fish. With visibility close to zero, locating food while trying to avoid becoming prey yourself is a gauntlet that numerous species have to run on a daily basis.

However, some fish have adapted to thrive in these conditions. Electrical fishes are adept at adaptation, being capable of hunting, navigating, and communicating within difficult environments.

Much to Learn

In terms of understanding the electrical fish, we've barely scratched the surface. Numerous new species have recently been described, such as the Amazon knifefish *Brachyhypopomus bennetti* and *B. walteri;* the knifefish *Akawaio penak* in Guyana; and, in the Congo River, the mormyrids *Petrocephalus boboto* and *P. arnegardi*. Even new genera are being described: *Procerusternarchus pixunain,* a recently discovered species of bluntnose knifefish from the Rio Negro, is a new genus and species. There are more than 500 known freshwater and marine species of electrical fish.

Electrical fishes, which can be either electrogenic or electroreceptive, are able to generate their own bioelectric fields using a specialized electric organ, made up of modified nerve or muscle cells. Electroreceptive fishes are species that can detect the electrical fields given off by other animals but cannot produce their own. For example, sharks possess specialized sensory organs called ampullae of lorenzini, which pick up electrical signals produced by muscle contractions in prey species but cannot produce their own electrical field.

The thought of an electrical fish often conjures the image of the most infamous species, the electric eel (*Electrophorus electricus*), which uses its short, powerful shocks to incapacitate its prey. Despite its common name, the electric eel is not a true eel but instead a species of knifefish with electric organs. These organs—the main, Hunter's, and Sach's organs—run four-fifths of the length of its body. Within these electric organs are specialized cells known as electrocytes, which fire simultaneously when the eel is under threat or when it is attacking prey.

It is this large quantity of electrocytes present in the electric eel that enables the animal to produce short shocks of up to 600 volts. Not all electrical species, however, use their capabilities for stunning their prey. Weakly electrical species produce discharges of less than a volt, which are used to navigate and communicate within their underwater world.

Apteronotidae

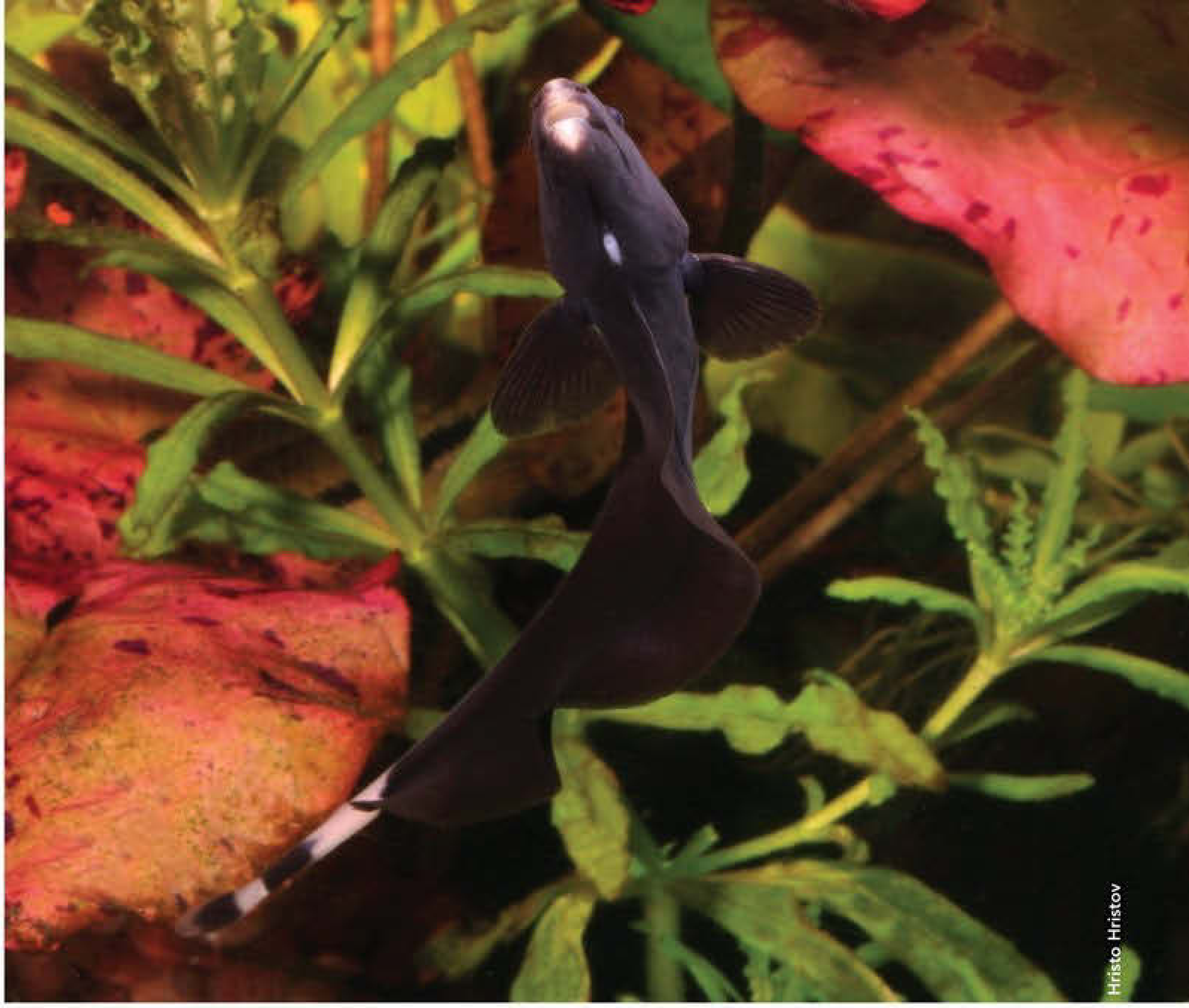
Apteronotidae are known as ghost or speckled knifefish and are found in freshwater environments throughout South America. They get their name from the South American native belief that the ghost of the recently deceased takes up residence with these fish. Unlike the electric eel, ghost knifefish produce a wave-like electric organ discharge (EOD), which they use for navigation and electrolocation. By emitting a constant stream of EODs, the ghost knifefish can sense the presence of nearby objects and structures by using its electroreceptors to detect variations in the amplitude and timing of the electric fields.

BLACK GHOST KNIFEFISH

The most commonly occurring species is the black ghost knifefish (*Apteronotus albifrons*). This species has an elongated and laterally compressed body, with a large anal fin running from the base of the pectoral fins along almost the rest of the length of its body. Like most other electroreceptive species, knifefish are most effective at sensing the electrical signals around them when their body is rigid.

As a result, electrical species use expanded dorsal or ventral/anal fins for locomotion. So effective is this long anal fin at propelling the knifefish, both horizontally and vertically, in the water column that concept robots using this swimming stance have been developed to try to provide greater control to submersible vehicles.

The black ghost knifefish is a distinctive-looking fish with a jet-black body and fins, bearing two white bands at the base of the tail fin and a white stripe that goes down the back of the head. They also have a large caudal peduncle, which houses the electric organ that emits the continuous EODs.



■ The black ghost knifefish has a jet-black body and fins, with two white bands at the base of its tail fin and a white stripe along its head.

The EODs of these nocturnal fish enable them to navigate and negotiate underwater objects in the gloom while hunting their prey. The baseline EOD frequency is usually constant, but it can vary in the presence of conspecifics (members of the same species). Such changes in response to social interactions are termed frequency modulations.

In some cases, female black ghost knifefish will generate EODs at a higher frequency than that of the male, which may allow for sex recognition. Black ghost knifefish deploy a jamming avoidance response to prevent EODs between individuals from overlapping, causing a sensory overload. When two individuals meet, they shift their frequencies until normal electrolocation can occur. Studies have also shown that black ghost knifefish display submissive signals when communicating, with sub-dominant individuals increasing the frequency of their EODs in the presence of a dominant individual.

Black ghost knifefish are a large species, with adults exceeding a foot (30 cm) in length. When kept in an aquarium, full-grown individuals require a tank in excess of 130 gallons (490 liters), while smaller individuals less than 10 inches (25 cm) in length can be housed in a 55-gallon (208-liter) tank.

As they are nocturnal, black ghost knifefish appreciate a dimly lit aquarium with floating plants to help reduce the glare from lights and plenty of caves and sunken wood in which to hide. A clear plastic tube can be used to enable the aquarist to observe the knifefish. The knifefish's electrolocation senses that it is surrounded by a solid object while the animal is still in full view.

In terms of water conditions, black ghost knifefish are sensitive to parameter fluctuations and do best in Amazonian-like conditions. A softwater setup with a pH that is neutral to slightly acidic should be provided, with a constant temperature range of 75° to 80°F (24° to 27°C) and no ammonia or nitrites present.

Recently, captive-raised individuals have started appearing on the market. These fish tend to be much smaller than their wild-caught cousins and may command a higher price. However, these fish adapt to captivity far better than wild-caught fish do and eliminate any pressure on wild populations. They're also generally in far better condition and health than wild-caught fish.

Black ghost knifefish, like all knifefish, are carnivores. Wild fish will often require live foods in the aquarium. Their smaller mouth

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■ *Eigenmannia virescens* is a shy, nocturnal species of knifefish that spends much of its time hiding.

means that such foods as blackworms, ghost shrimp, and brine shrimp should make up the bulk of their diet. They will quickly learn to appreciate frozen foods, and even pellets will soon be taken eagerly.

As they grow, they will eat small fish, which should be a consideration when choosing tankmates. Captive-raised individuals will generally eat meaty pellets, but supplementing the diet with frozen foods is always recommended.

BROWN GHOST KNIFEFISH

The brown ghost knifefish (*A. leptorhynchus*) is a smaller species of ghost knifefish, typically reaching lengths of 8 inches (20 cm) in the home aquarium. Unlike the black ghost knifefish, the male brown ghost knifefish discharges its electric organ at a higher rate than that of the female, again using EODs to hunt and navigate.

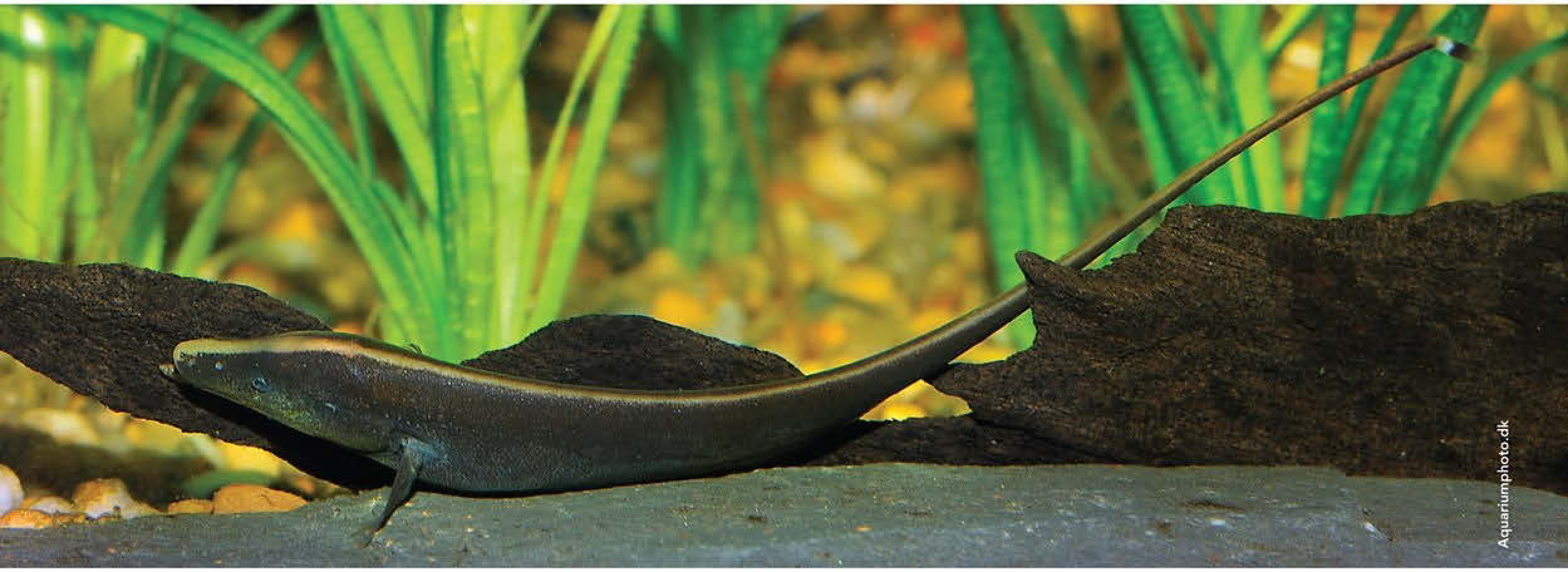
While aggressive with other Apteronotidae species, the brown ghost knifefish is a peaceful fish on the whole and will happily co-exist with tankmates large enough to avoid being swallowed. Care should be taken not to house this, or any other ghost knife, with nippy fish. Its long tail is often irresistible, and knifefish are not able to swim fast enough to avoid being nipped, especially in an aquarium. Eartheaters (*Geophagus* and related species), other relatively peaceful cichlids, larger tetras, and peaceful catfish species make ideal companions.

Other Knifefish

On occasion, lesser-known species of knifefish, such as the duck-billed knifefish (*Compsaraia samueli*) become available. This remarkable species dwells deep down in the Amazonian waters and has a pale, translucent body with small eyes. The males have a larger snout, which they use to fight in a manner similar to fencing, so only one male should ever be kept per tank. This species was described only in 2009, and although sporadically available within the trade, their conservation status and specific requirements are as yet unknown.

Knifefish from the Sternopygidae and Notopteridae families appear less frequently. Sternopygidae, often referred to as glass, or rattail, knifefish, inhabit streams and rivers within South America. The likely species an aquarist will encounter is glass, or green, knifefish (*Eigenmannia virescens*). Like the black ghost knifefish, this species is shy and nocturnal, preferring to hide among the plants, bogwood, or tubing provided. They are social creatures that do best in a group of five or more, forming a hierarchy of dominant and submissive individuals.

Notopteridae species include the African knifefish (*Xenomystus nigri*) and the giant clown knifefish (*Chitala ornata*). The African knifefish is one of the hardiest species to keep and will occasionally emit a barklike noise when ejecting water from its swim bladder. Growing to approximately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■ Brown ghost knifefish (*A. leptorhynchus*).

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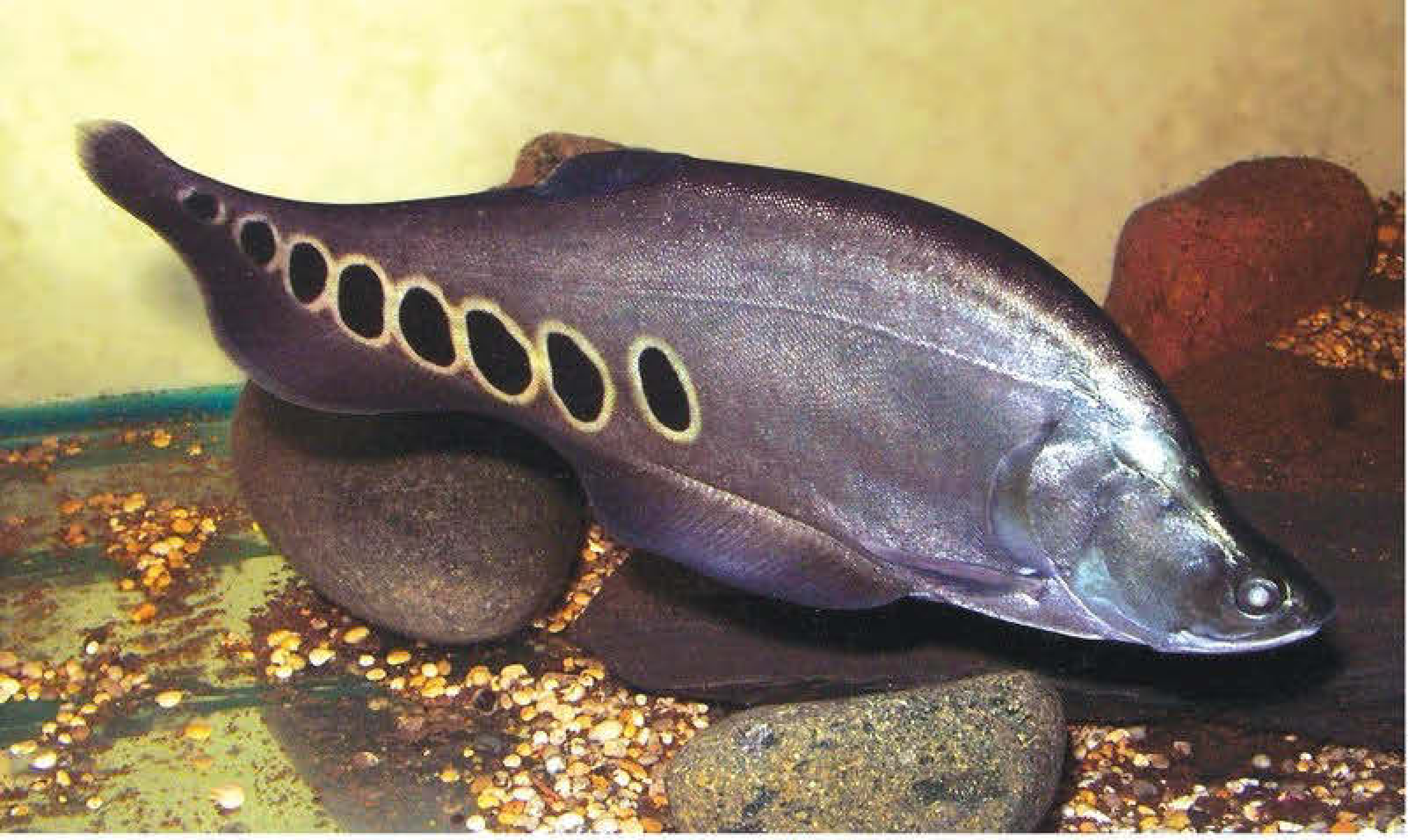

Iggy Tavares

■ Giant clown knifefish (*Chitala ornata*).

Aquariumphoto.dk

■ Peter's elephantnose fish (*Gnathonemus petersii*) uses EOD during electrolocation and electrocommunication.

one foot (30 cm), it is an appropriately sized species to keep in a home aquarium.

Clown knifefish, on the other hand, can reach sizes of up to approximately 3 feet (one meter) in length, requiring tanks in excess of 185 gallons (700 liters) to adequately house them. These larger knifefish will require larger-sized foods in the aquarium and will certainly eat smaller fish. Large pellets, frozen shrimp, and large-ingredient frozen foods make great dietary options.

Peter's Elephantnose Fish

Another commonly encountered, weakly electrical fish is Peter's elephantnose fish (*Gnathonemus petersii*) from the Mormyridae family hailing from Central and West Africa. The fish gets its name from the trunklike projection on the front of its head, although this is actually an extension of its mouth, as opposed to the nose on an elephant. Like all mormyrids, Peter's elephantnose fish use EOD during electrolocation and electrocommunication.

A recent study by Philine Feulner at the University of Sheffield, in England, has shown that male elephantnose fish lure females with the aid of an electric field. With numerous closely related species living together in murky waters, finding a mate can be difficult. The research shows that females can locate and select males of their own kind based on their "electric aura," as opposed to males of other similar species. This electrical attraction helps to preserve the genetic differences between near-identical species and shows that elephantnose fish "mate assortatively according to EOD waveform characteristics."

As a result of their capacity to process electrical signals, Peter's elephantnose fish have an increased brain mass compared with similar-sized fish species. They have the largest brain-to-body-weight ratio of all known living vertebrates, and up to 60 percent of the fish's oxygen uptake is used by the brain.

Like the electric eel and knifefish species, Peter's elephantnose fish inhabit dimly lit, slow-moving waters. Originally thought to be blind because of the unique structure of their retina, it was later determined that they have excellent low-light vision, enabling them to spot predators in the gloom.

When keeping these fish in a home aquarium, their housing should reflect these requirements. Peter's elephantnose fish are timid and nocturnal, so any prospective tank should have reduced lighting, along with plenty of bogwood, rocks, and such low-light vegetation as Java fern or *Anubias*.

As with knifefish, the addition of a "ghost tube" will provide security while facilitating viewing during daylight hours. A soft, fine substrate should be provided to allow the fish to sift through, hunting for food, without damaging its mouth parts. Elephantnose fish tend to be unfussy eaters, accepting a variety of dried flakes, pellets, frozen foods, and live aquatic invertebrates, with various aquarists reporting success with hand feeding.

In a home aquarium setting, an adult Peter's elephantnose fish will attain a size of 9 inches (23 cm), so one individual will require a tank that's around 65 gallons (246 liters). Keeping a group of elephantnose fish will reduce nervous or skittish behavior, with preferably five or more kept together to prevent intraspecific territorialism and consequent bullying.

Although generally considered peaceful, elephantnose fish may be aggressive toward smaller species, so consideration should be taken when introducing tankmates. Other African species such as small birchirs, butterflyfish, and Congo tetras make ideal companions.

Fascinating Fish

Weakly electrical fish make curious and fascinating additions to suitable-sized aquariums. When kept under the correct conditions, they will reward the aquarist with an array of novel and unique behavioral patterns. If you can meet and maintain the proper environmental parameters, you will be able to sit back and enjoy nature at work.

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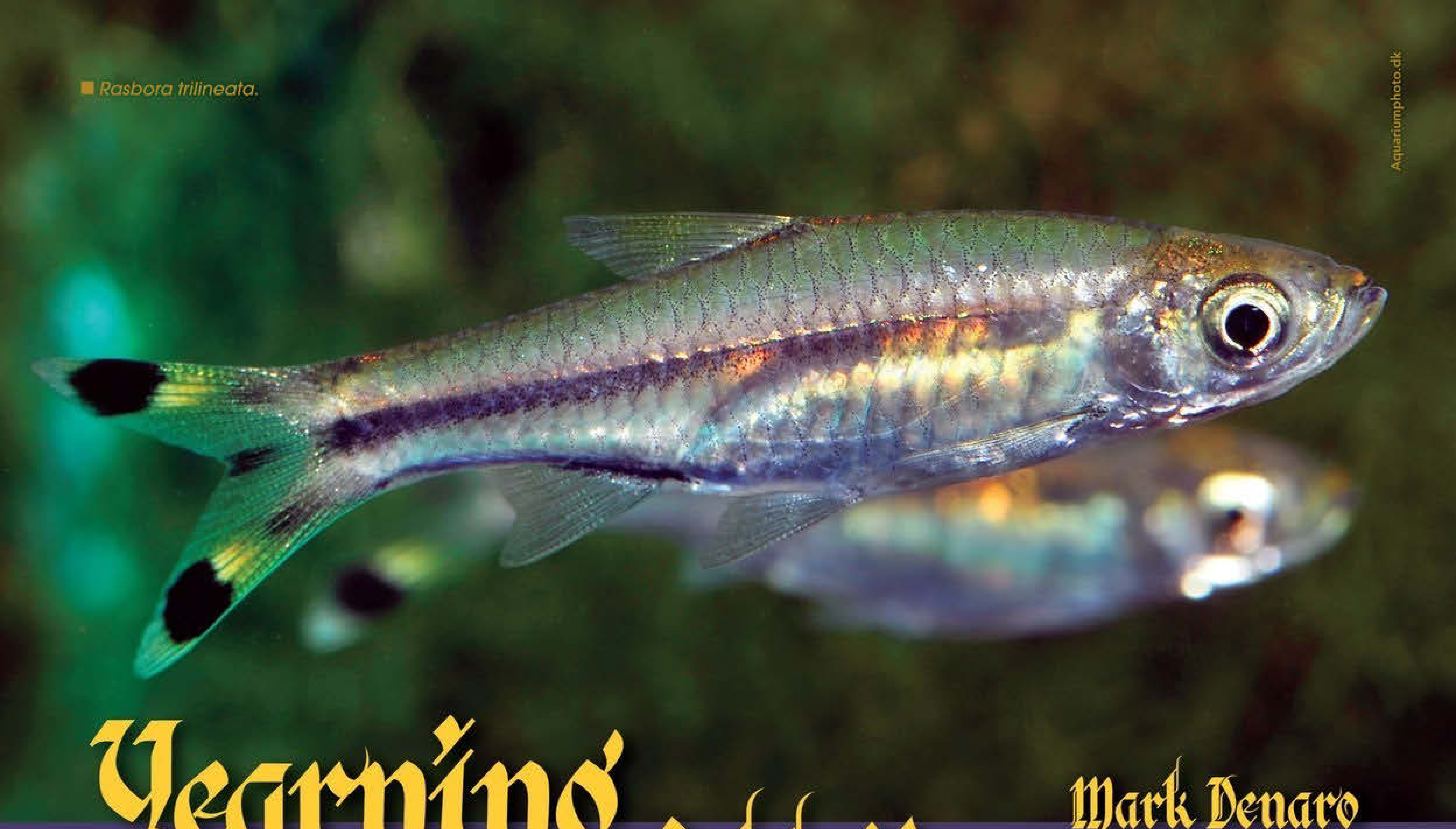

Rasbora trilineata.

Aquariumphoto.dk

Yearning for Some Old Favorites

Mark Denaro

We aquarium hobbyists all share the joy of perusing our local shops to see the fishes that are available. Over the course of the many years that I've been keeping fish, I've noticed that a walk down the rows of fish tanks at these shops is an experience that has changed significantly.

For one thing, a new wave of technology has altered how the tanks run. Tank lights are much brighter, and the undergravel filters are now gone.

Countless Varieties

Change has also impacted the different species available. Our constant quest for "what's new" has led to changes in the color varieties of many species and hybrid forms that appeal to some hobbyists while being abhorrent to others. Add to this the steady stream of new species that reach the hobby, and the result is a mindboggling number of options to those fishkeepers who've enjoyed the hobby for a long time.

The flip side of all this change, however, is that some of the old-time favorites that were once the backbone of the industry have become much less common. Indeed, many of the "bread and butter" species of my formative years in the 1970s are now seldom seen in shops. That's what has led me to take this stroll down memory lane to examine some old-time favorites.

The longer I think about this topic, the greater the number of different species that come to mind. While many oldies have been left out, the ones included here are those that I remember seeing almost every time I went into any shop when I started in the hobby.

Swordtails

Swordtails can still be found everywhere, but they have changed significantly. Today's swordtails are available in a myriad of color patterns that we would never have imagined in the 1970s. They are, however, not the magnificent physical specimens they used to be.

With the increase in color morphs has come a decrease in the size and quality of today's swordtails (*Xiphophorus hellerii*). While I won't say it was common, it was not unusual to walk into an aquarium shop in the 1970s and find a tank full of swordtails that exceeded 6 inches (15 cm) in length. That just doesn't happen today. For whatever reason, swordtails just don't grow that big these days. (Some hobbyists may have doubts about the existence of swordtails of that size, even if I'm going by total length and not by standard body length, and even if I'm including the male's tail—but that is my honest recollection.)

There are two color patterns that were once common yet are difficult, if not impossible, to find today. The gold wag swordtail was one of the most commonly available colors and was my personal favorite, and the fish at that time referred to as a Berlin swordtail was a beautiful deep, dark red. At least it was that color in my area; I understand that hobbyists in other areas have always seen swordtails called by that name to be fish whose primary body color was black with bluish spangling.

In any event, today's Berlin swordtail is black rather than red. The Berlin I knew disappeared soon after the red velvet swordtail hit the market. The red velvet is brightly colored but compares quite poorly to the old Berlin, in my opinion. I have seen a fish similar to what I knew as the Berlin offered a few times in the last 15 years as a blood red swordtail. While not as nice as the original Berlin, the blood red swordtail is a decent facsimile and worth seeking out.

The original gold wag was a deep-yellow fish with black fins (wag) and red squiggly horizontal lines on the body. The fish offered more recently as a gold wag is a much paler yellow and generally doesn't have the pattern on the body. It is seldom seen in US shops and probably for good reason, as it doesn't offer anything worthy of recommendation.

Blind Cave Tetras

Blind cave tetras (*Astyanax jordani*), with their lack of eyes and pigmentation, are interesting in their ability to not just survive but to thrive in tanks housing fish with vision. Their constant search for anything edible occasionally leads them to fin nipping, and it is this trait more than anything that has led to their decline in popularity.

They are, however, a room temperature-tolerant species with great appeal to children. The blind cave tetra is also a good choice for a community tank that includes active species. They are easy to breed, making them a desirable tetra for a local club's Breeder's Award Program.

Barbs

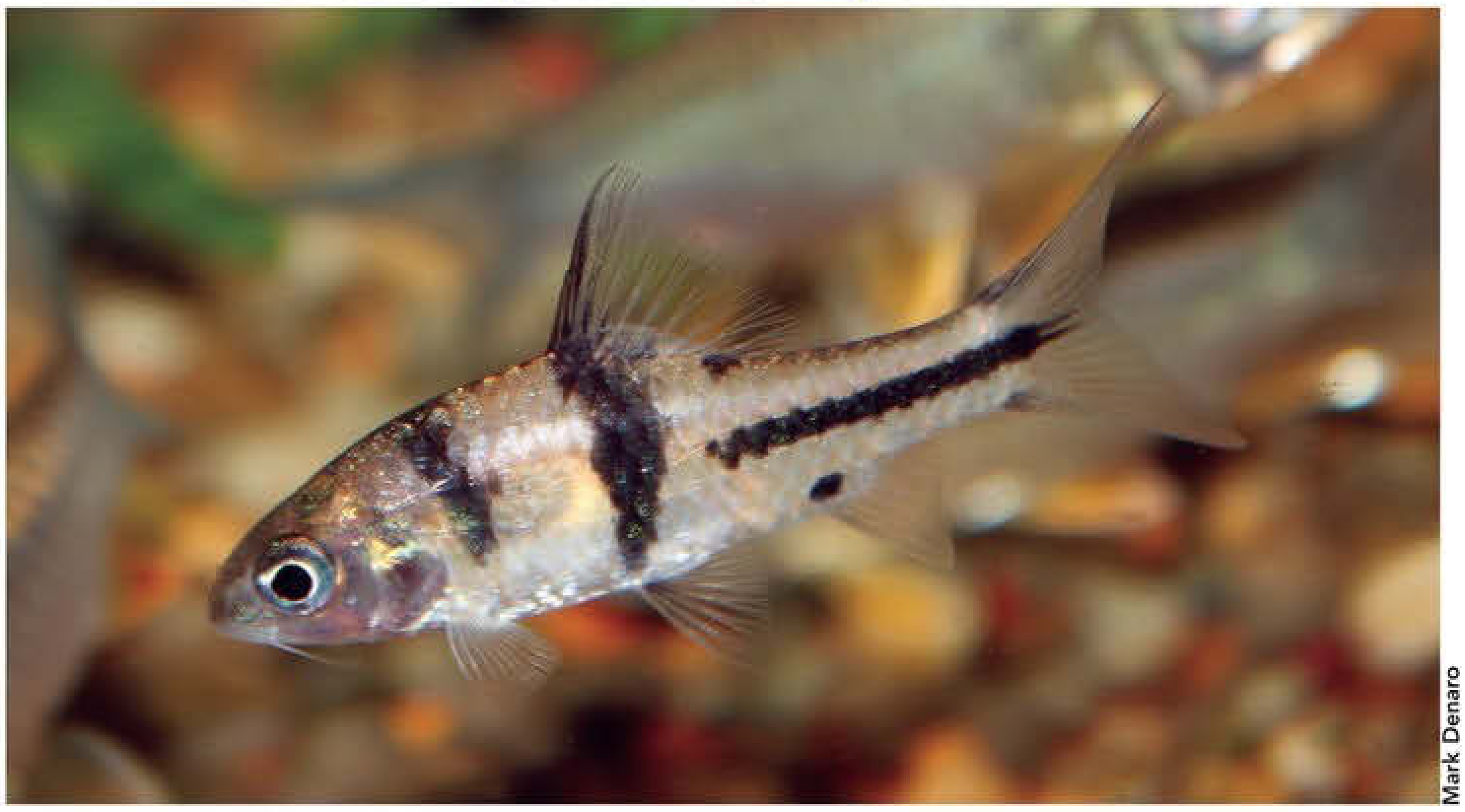
Two species of barbs are particularly worthy of note. With the recent revision of the genus *Puntius*, both were moved to new genera.

The T barb (*Barbodes lateristriga*) is a large, boisterous species, growing to 7 inches (18 cm) in length. T barbs are very active and make a great addition to a community of similarly sized, outgoing species. Its activity level may keep shy fish in hiding, so care must be taken when choosing tankmates.

The decline in popularity of this species is somewhat of a mystery to me. It is behaviorally similar to the tinfoil barb but remains much smaller. That normally would result in the T barb's being the more popular of the two, but it just hasn't worked out that way.

Shutterstock/Hamsterman

■ The blind cave tetra is a hardy species that is fascinating to watch.


Mark Denaro

■ *Barbodes lateristriga.*

The clown barb (*B. dunckeri*) can grow to 6 inches (15 cm) in length but seldom exceeds 4 inches (10 cm) in the home aquarium. This active schooling species does best in aquariums of at least 55 gallons (208 liters) and should be kept with similarly sized active species.

The clown barb is a delightful species with beautiful colors that are shown to best effect in a planted tank. Unfortunately, it has a reputation for eating plants. However, while it will nibble a bit on soft-leaved plants, I've never had any significant issues with this behavior. If it's kept in a low-tech planted tank with *Anubias*, *Aponogeton*, *Bolbitis*, *Echinodorus*, *Microsorum*, *Nymphaea*, and similar species, it will do quite well and will seldom, if ever, bother the plants.

Scissortail Rasboras

The scissortail rasbora (*Rasbora trilineata*) is a graceful, attractive species that is peaceful and schools nicely. It seldom exceeds 2½ inches (6 cm) in length but can reach 4 inches (10 cm). It is extremely hardy and is an ideal beginner's fish.

When I started keeping aquariums, every shop had a tank of scissortails. Today, it is very hard to find in shops. Of all the species included here, this is the one whose decreasing popularity baffles me most. Scissortail rasboras should be a staple in the aquarium trade, but they currently aren't.

This was one of the first fishes to go into my first "real" aquarium, a 5-gallon (19-liter) tank kit that I got for Christmas in 1970. The first fishes added were two scissortails, two neon tetras, a tiger barb, and a black tetra. You can imagine how successful that mix was, but the species that survived was the scissortail.

Mark Denaro

■ *B. dunckeri.*

Those two fish lived in that tank for years. Oh, and by the way, the tank didn't have a heater and was in a cool corner of the lower level of my parents' house, but even the fluctuating temperatures didn't faze them. In addition to their hardiness, they're fairly easy to breed and therefore a great choice for hobbyists who need to breed a rasbora for their club's Breeders Award Program.

Scarce Cichlids

In cichlids, more than any other family, hobbyists seem to be enamored with the new. As new species become available, old favorites seem to fade away. Many of them are occasionally available, like keyholes (*Cleithracara maronii*), blue acaras (*Andinoacara pulcher*), and rainbows (*Archocentrus multispinosus*), although all the names of the genera (formerly *Aequidens* for the first two mentioned and *Herotilapia* for the rainbow cichlid) have changed. Other old favorites, however, are very hard to find.

Egyptian mouthbrooders, now known as *Pseudocrenilabrus multicolor*, have been in the hobby for more than 100 years but have become very scarce. The only way you're likely to find them these days is by finding an aquarist who maintains a breeding group. I haven't seen *P. multicolor* in a shop in over 20 years.

Anyone with the good fortune to keep *P. multicolor* will find it to be a delightful small fish that grows to a maximum of about 3 inches (7.5 cm) in length. A great choice for the beginning cichlid hobbyist, Egyptian mouthbrooders are easily bred but can be a bit quarrelsome among themselves.

Astatotilapia burtoni, which was known for years as "Hap" burtoni because of its former generic name of *Haplochromis*, is another species that's now likely only found through cichlid specialists. This was a readily available, inexpensive species back in the 1970s and through most of the 1980s before it all but disappeared from the hobby. This aggressive, territorial species can grow to 6 inches (15 cm). It is an easily bred mouthbrooder that can be kept with other Rift Lake haplochromines. The males can be quite colorful, but females are a drab silvery-gray.

Lake Malawi Cichlids

Lake Malawi offers many forgotten treasures. Of these, three are favorites of mine. The shell-dwelling *Maylandia lanisticola* and the better-known *M.*

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■ The scissortail rasbora is a calm, attractive species.

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Diane Brown

■ The Egyptian mouthbrooder is a great cichlid for the beginning hobbyist.

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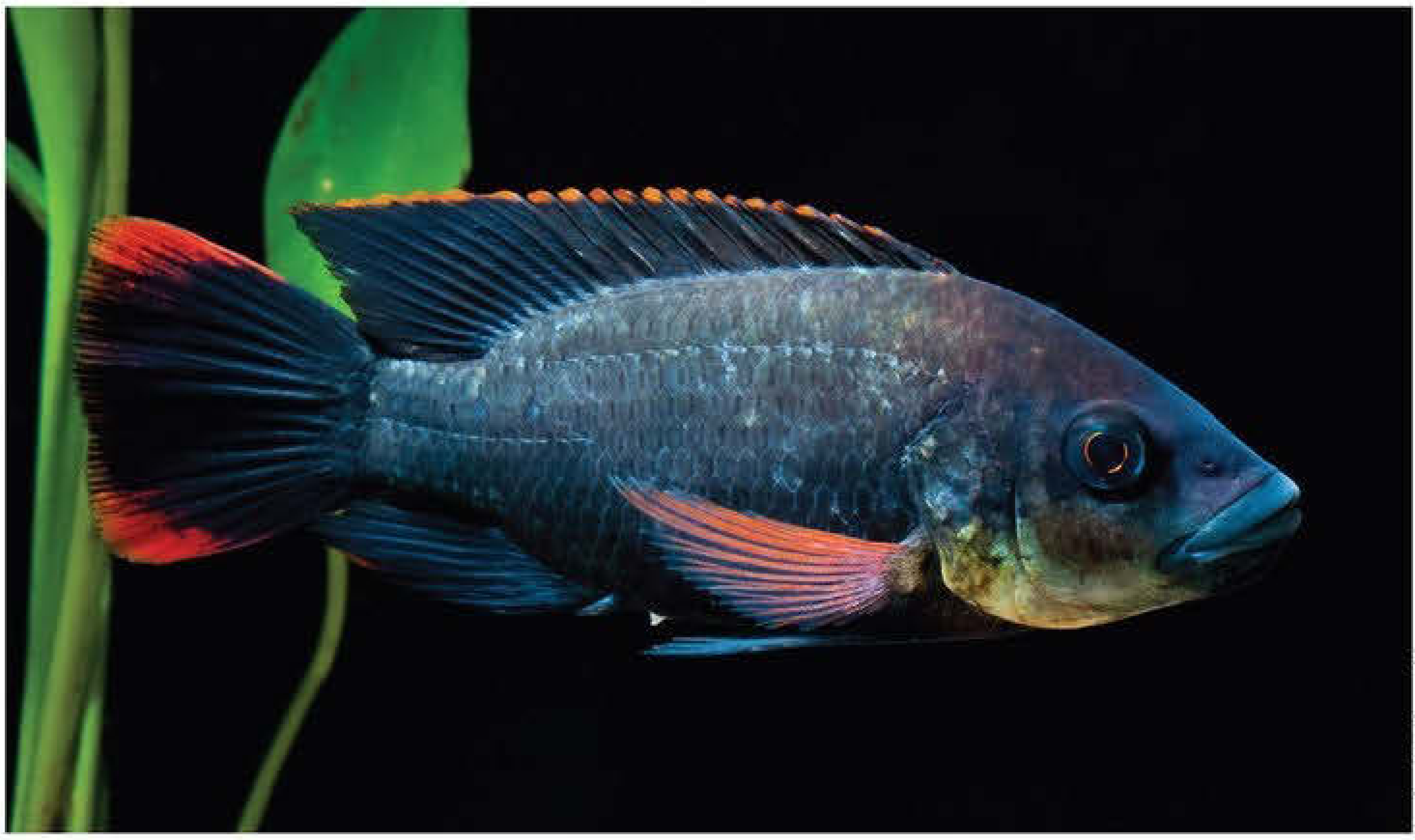
■ Rainbow cichlid (*Archocentrus multispinosus*).



Andrzej Zabawski

■ *Oreochromis mossambicus.*

livingstonii were huge hits when they were first introduced. *M. lanisticola* is smaller and more brightly colored but was never as readily available.

M. livingstonii was a prominent species in the late 1970s and early 1980s. Capable of reaching 6 inches (15 cm) in length, I've never seen one exceed 4 inches (10 cm). These were fairly peaceful species as *Pseudotropheus* (their older generic name) went, but they weren't as colorful as many of the others. The introduction of all the shell-dwelling Tanganyikan cichlids meant that they weren't as interesting behaviorally as we all initially had thought, so they fell by the wayside.

A species that I maintained for a while in the early 1980s was *Gephyrochromis moorii*. This subtly colored yet beautiful species is one of the more peaceful mbuna species and is not overly territorial. It is similar in appearance and behavior to *Pseudotropheus* sp. acei (aka *P.* "acii") which I believe will be added to the genus *Gephyrochromis* when it is officially described. To my eye, *G. moorii* is a much more attractive species than is the acei, yet the acei is still quite popular today, while *G. moorii* is now a hobby rarity in the United States.

Mozambique mouthbrooders (*Oreochromis mossambicus*) are big cichlids that have seen a decline in popularity, but that might be a good thing. Males are beautifully colored, being jet black with white cheeks and lower parts of the face. Females are a gray-brown color.

The problem is that this species can easily grow to 16 inches (41 cm) in length, making it unsuitable for most home aquariums. A Mozambique mouthbrooder makes an attractive display fish for someone who has a properly sized tank. Besides being easy to maintain and breed, there is a selectively bred "gold" variant in which both sexes are a creamy golden color.

More Fishes of Memories

I've merely scratched the surface of the list of fishes that I have seen come and go in the hobby. I hope this brings back memories of past favorites to longtime hobbyists or inspires new fishkeepers to look for some species that they've not yet seen.

I'm sure many of you can think of numerous other species that have lost their popularity over time. I hope you remember them fondly.

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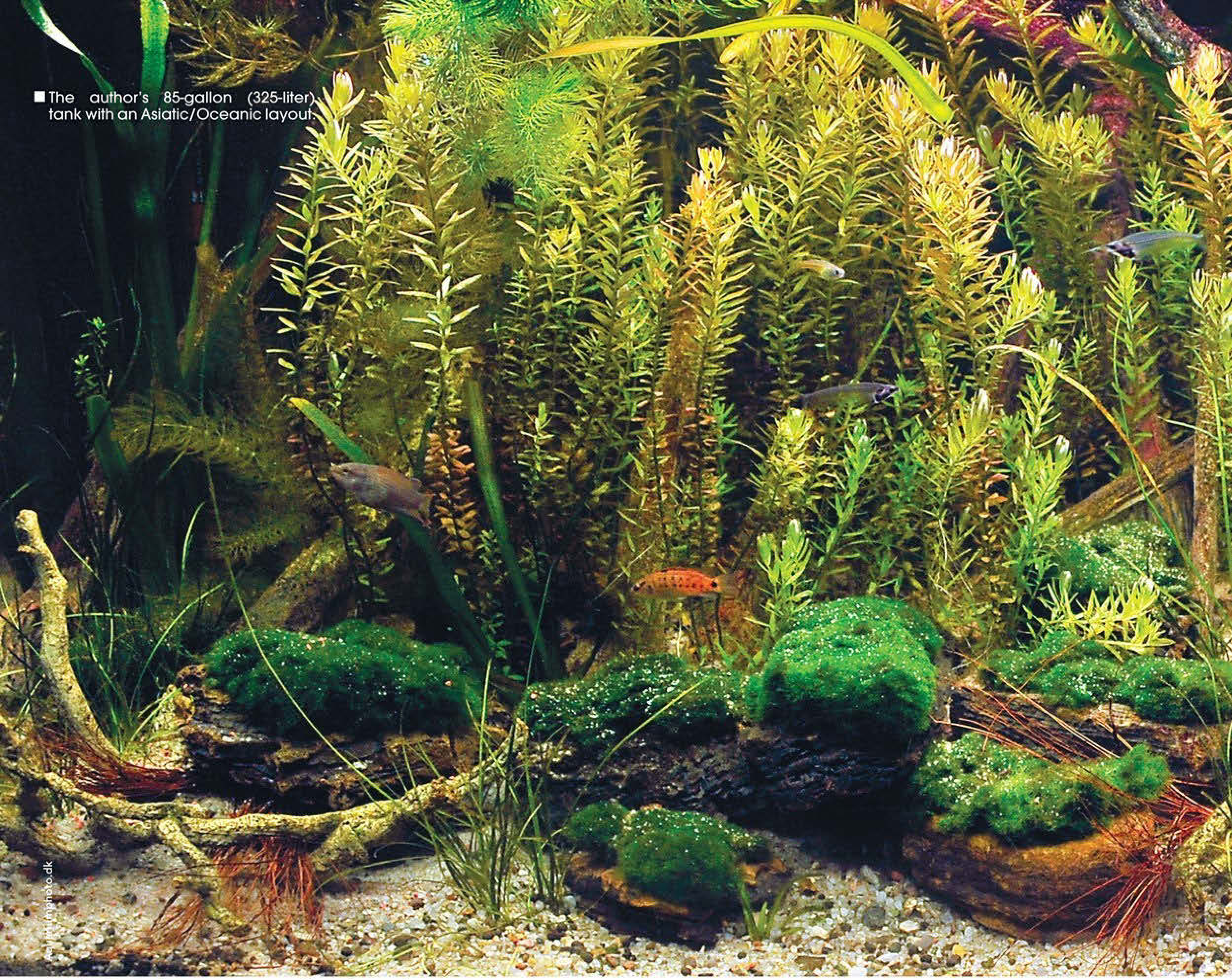

The author's 85-gallon (325-liter) tank with an Asiatic/Oceanic layout.

Being a professional photographer, I have enjoyed creating aquarium layouts that I believe anyone can build. I feel that I'm not alone when I say I'm constantly thinking about new aquarium layouts. However, I'm a bit impatient about aquascaping. I find it difficult to wait months for plants and mosses to become established before I can truly enjoy the tank's appearance and use it for my photography.

I see many stunning displays from the world's leading layout experts in such magazines as *TFH*. While incredibly beautiful, these layouts are not easily achieved, so I often use some of their ideas and convert them into my own techniques that I can easily apply to my aquarium. The layouts I end up with are not so time-consuming and result in an aquarium layout that, I believe, is a little easier for the common aquarist.

Photo Tank Influence

I have solid experience with photo tanks, including how to decorate them to get the best background for my fish photography. Quite a few of these photo-tank layouts can be applied to bigger tanks, which can result in beautiful displays for the tank inhabitants.

I recently tested this theory with my own home aquarium. I wanted to change the layout for my 85-gallon (325-liter) tank from an Amazon-themed design to something with more of an Asiatic/Oceanic angle, so I approached the layout of my home aquarium as I would for a photo tank.

Greenery

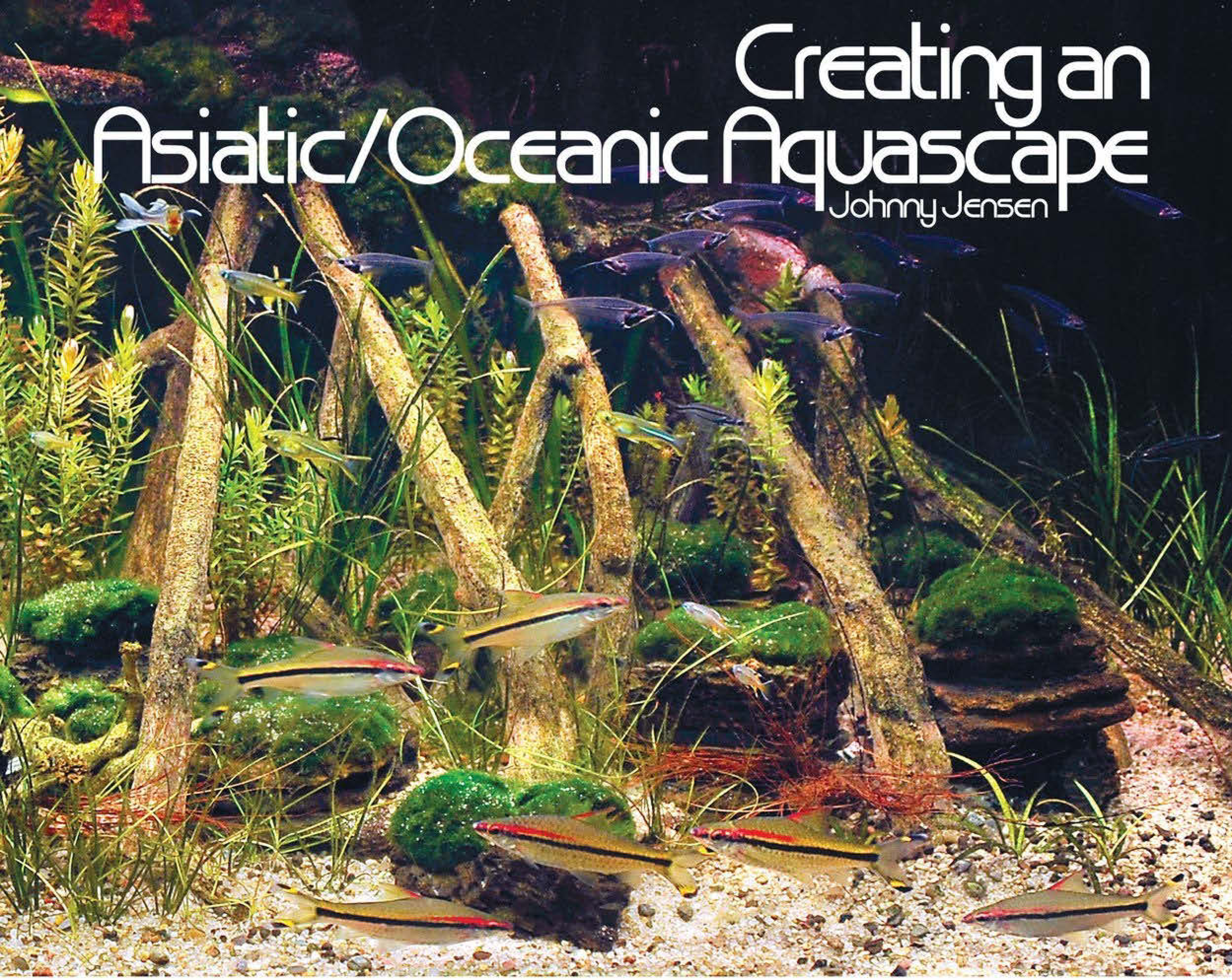
I wanted to make a lush environment of green moss on rocks, but I didn't want to wait a month for the moss to grow in and spread. I also wanted it to be a dense display, so I used readily available algae ("Marimo") balls.

I found it easy to use my fingers to open the algae balls and make a small carpet of green growth. To fasten them to the "Pagoda" rocks, I tied them on with thin fishing line. It is a bit of a challenge to tie knots with such fine line, especially when I needed to tie enough rocks to create an attractive display in my tank.

However, with perseverance and a few breaks to give my crossed eyes a rest, it took me only a couple of hours to complete the job. The clear fishing line becomes virtually invisible in water, becoming noticeable only in close-up photos.

Creating an Asiatic/Oceanic Aquascape

Johnny Jensen



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■ A *Badis blosyrus* outside a pleco cave.

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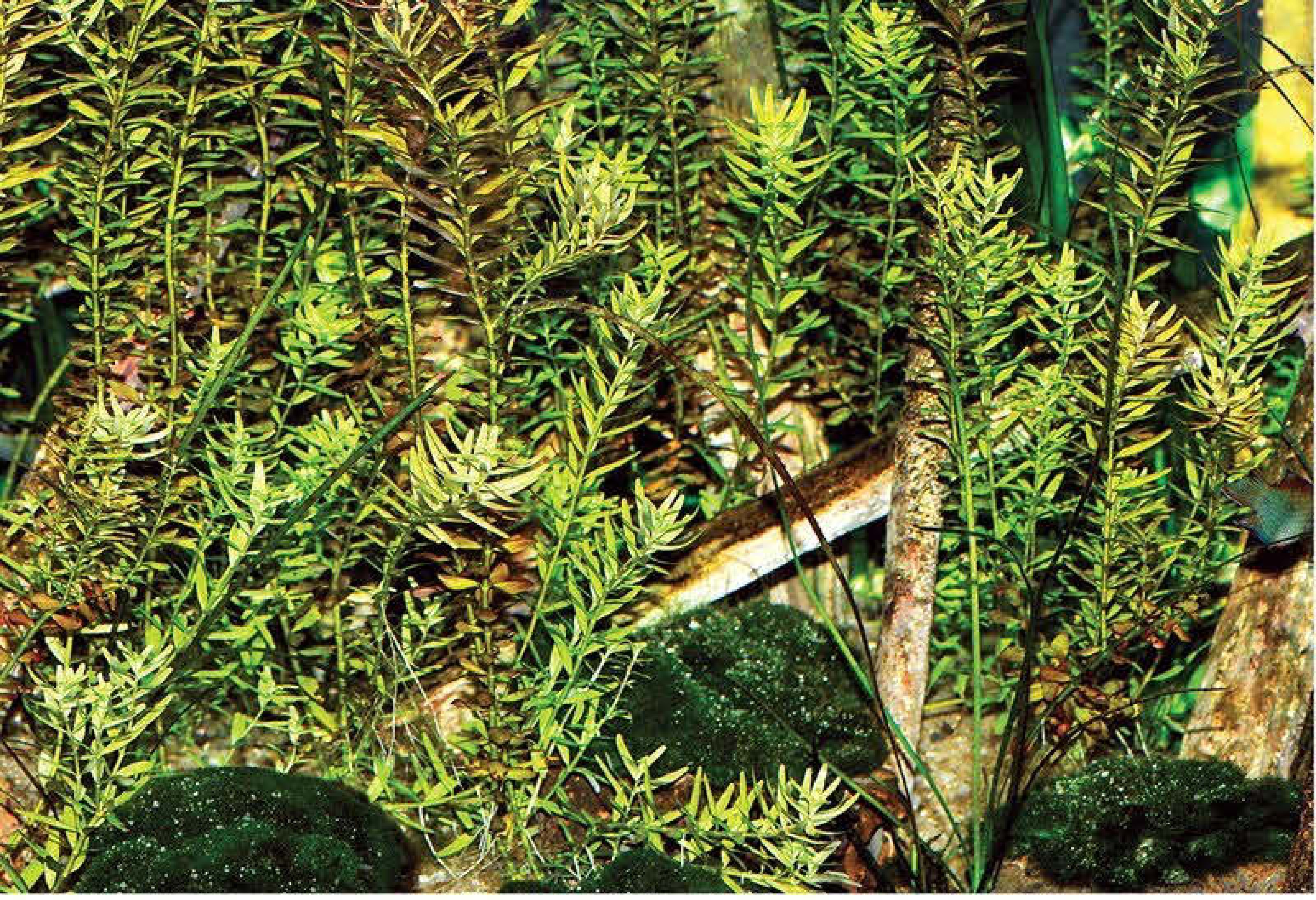
■ A *B. badis* cruises past a rock covered with Marimo “moss” balls.



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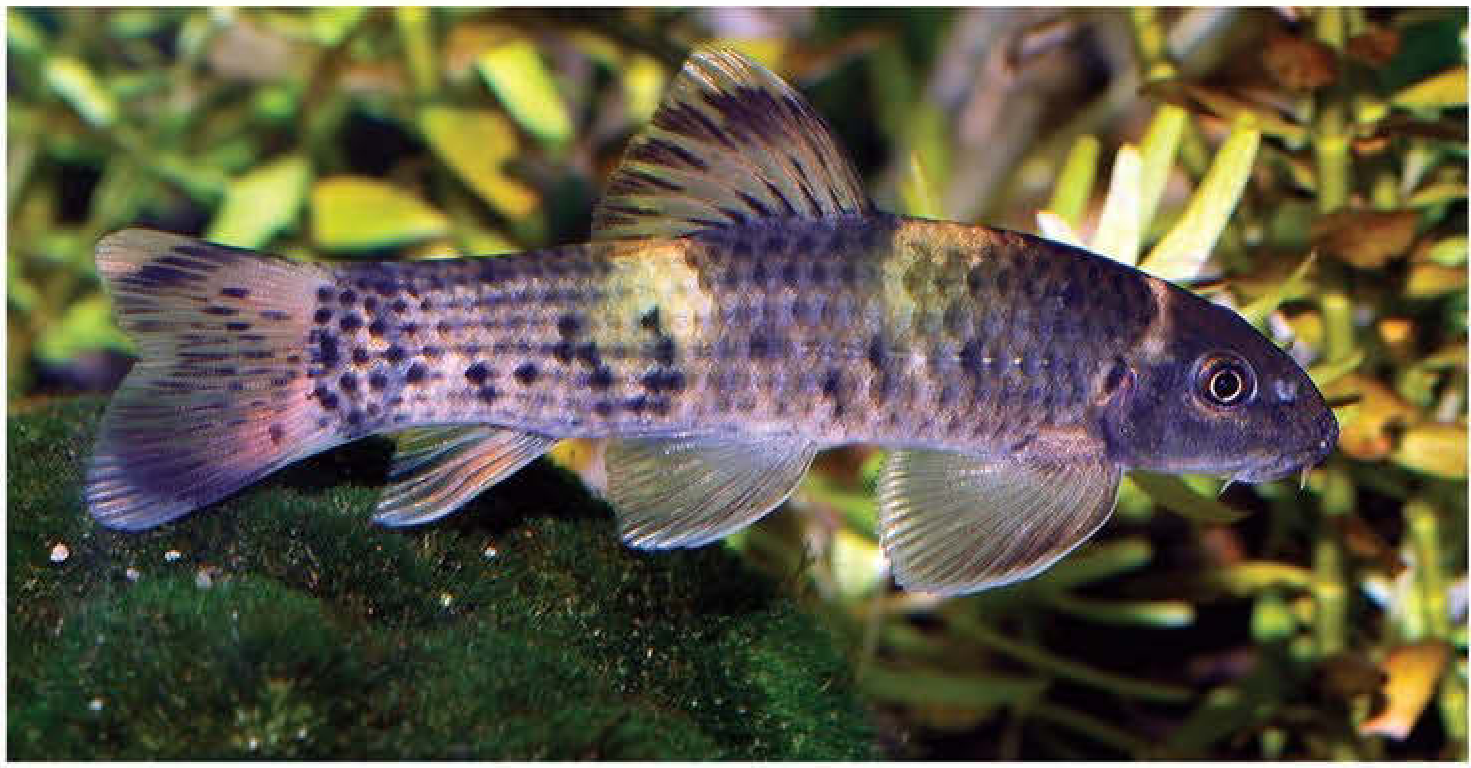
■ *Rotala rotundifolia* sp. "Indica" fits in nicely with mangrove roots and moss-covered rocks.



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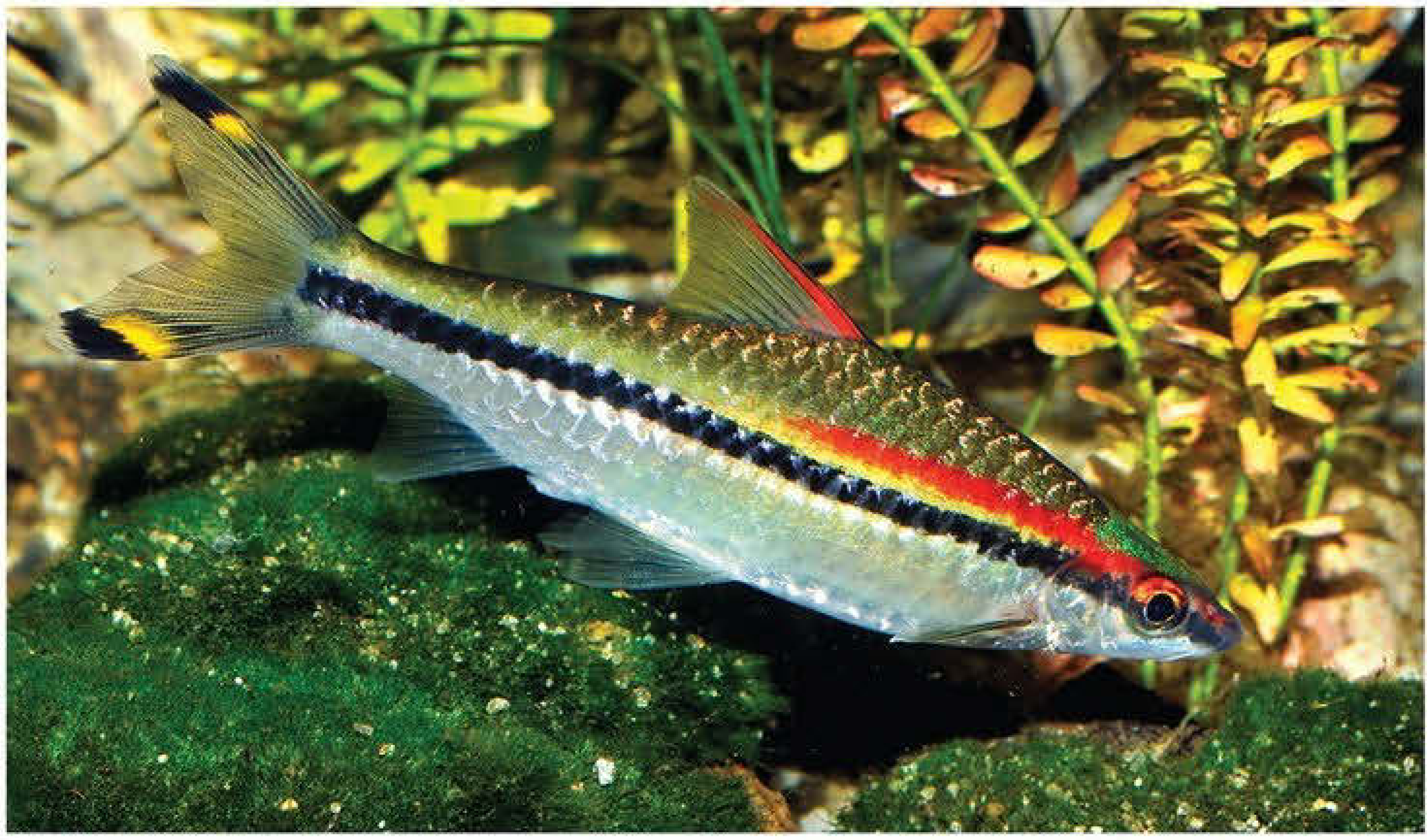
■ *Garra flavatra.*



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■ *Sahyadria denisonii.*

Fish species

Denison's barb, redline torpedo barb
(*Sahyadria denisonii*)
Glass catfish (*Kryptopterus vitreolus*)
Black paradisefish
(*Macropodus erythropterus*)
Saddled lizard loach
(*Homaloptera orthogoniata*)
Panda log-sucker (*Garra flavatra*)
(Common) Badis (*Badis badis*)
Red badis (*B. blosyrus*)
Popondetta Blue-eye
(*Pseudomugil connieae*)
Indian glassfish (*Parambassis lala*)
Peacock gudgeon
(*Tateurndina ocellicauda*)
Day's paradisefish
(*Pseudosphromenus dayi*)

Plant species

"Indica" rotala
(*Rotala rotundifolia* sp. "Indica")
Freshwater eel grass (*Vallisneria* sp.)
Common hornwort
(*Ceratophyllum demersum*)
Algae balls (*Aegagropila linnaei*)

Natural vs. Functional

I used a mix of sand and river gravel, because I think that looks more natural for most of my general layouts. However, since I wanted to put the moss-covered rocks on a gentle slope, it was necessary to put in some filter-material barriers to stop the sand from sliding too much.

In between the rocks, I added a couple of pleco caves. These tubes are not very attractive, and they don't have a natural appearance, so I hid them as much as possible while still allowing them to be completely functional. I placed them near the front glass so I would have the pleasure of being able to view the cave dwellers.

I already had artificial mangrove roots from my previous setup, but a variety of roots will suffice. I added a few extra details by placing some coconut fiber where the roots meet the sand to give the impression of ultra-thin roots extending from the main root.

Motivation

My tendency in the past has almost always been to create Amazon layouts, because I love the fishes from the Amazon region. However, on this occasion, I wanted to keep some wonderful species from Asia and Oceania. It also enabled me to get some better photographs of them.

As of this writing, I have had my new tank set up for a month, and it has produced some awesome fish photos. The *Rotala* sp. plants have grown in nicely, which has inspired me to add a new batch of fish to photograph.

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Iggy Tavares

A World of Aquatic Wonders at Shanghai Ocean Aquarium

Shanghai Ocean Aquarium is located next to the Oriental Pearl Tower.

Iggy Tavares

A medical conference recently sent me to Shanghai, China, where I spent my time mostly in the Lujiazui area, a relatively new business district that is separated from the old city by the Huangpu River. Part of the Pudong New District, the area is covered in skyscrapers and shopping malls.

Apart from the conference, an afternoon city tour enabled me to visit the Yuyuan Garden, the Jade Buddha Temple, the Dongtai Lu Antique Market, and Shanghai's thriving waterfront. But my main interest was in visiting Shanghai Ocean Aquarium.

Shanghai Ocean Aquarium, with its theme of "Across Continents through Worlds of Water," is a relatively new attraction that first opened to the public in 2002. Fortunately for me, the aquarium is also in the Lujiazui area, next to the Oriental Pearl Tower.

Special Exhibitions

Upon entry into the darkened concourse, visitors start their tour of the main building by taking an escalator up to the top level of the three-floor facility. The Special Exhibitions area has three interesting features.

The first exhibit is SOS—Save Our Sharks, which features many wall displays about endangered sharks. There are also several small tanks with baby bamboo and cat sharks, a touch tank for brown-banded bamboo sharks, and a display of developing shark embryos in their egg cases.

Next is Yangtze River Rare Aquatic Animals, an exhibit that showcases a dozen small fish, from Chinese bitterlings to paradisefishes, and includes many common aquarium fish from an estimated 300 species that can be found in the river.

The final exhibit in the Special Exhibitions area is Martial Arts Championship of Aquatic Animals, which showcases martial art forms inspired by several aquatic animals. The exhibit is interspersed with Chinese art highlighting the many amazing survival skills of aquatic creatures while focusing on some venomous and poisonous aquatic life.

China Zone

As might be expected, with China having more than 900 species in 302 genera, the China Zone offers four large displays of Chinese fish. Endangered fish in the first display include large, beautiful specimens of Chinese sturgeon (*Acipenser sinensis*) and Chinese sucker fish (*Myxocyprinus asiaticus*), which have both suffered a massive decline in the wild, because dams prevent them from reaching their spawning grounds in China's longest river, the Yangtze.

Several juvenile Chinese alligators (*Alligator sinensis*) are part of a large paludarium-type display. Most of the time, visitors will find them motionless, resting on partially submerged rocks while domestic ducks stay out of reach and fish swim far below the surface. Chinese alligators are critically endangered, with just 200 specimens known to exist in the wild, and are found only in a restricted area around the lower Yangtze River.

A huge specimen of Chinese giant salamander, a critically endangered amphibian that more resembles a reptile, is displayed in a front enclosure for easy viewing. The Chinese giant salamander has a varied diet that includes frogs, crabs, fish, and other aquatic creatures. In a separate enclosure, two dozen free-swimming common carp (*Cyprinus carpio*) form another part of the display.

The Famous "Four Family Fish" makes up the final part of the China Zone. It's an attractive and colorful display in an open-top aquarium, where signs discourage visitors from placing their hands into the display. The tank inhabitants are descendants of bighead, silver, black, and grass carp that, in the wild, occupy different levels in the water column and feed on different items. As they do not compete with each other, the carp have been successfully kept together in Chinese polyculture for thousands of years. The display contains all four types, yet it is the colorful goldfish and white koi carp that catch the eye.

Iggy Tavares

■ Colorful goldfish can be found in the "Four Family Fish" display of the China Zone.

South American Zone

The South American Zone has several interesting small to mid-sized displays that include a long, heavily planted aquarium dedicated to tetras; another with a shoal of large black-barred red hook silver dollars (*Myleus schomburgki*); and cupid cichlids (*Biotodoma cupido*) that look stunning in a small aquarium. The exhibit also includes a matamata turtle (*Chelus fimbriata*) that appears rather menacing, as if waiting for a fish to wander into range to be quickly snapped up.

Iggy Tavares

■ The South American Zone is where visitors can find a matamata turtle.

Under the Amazon is a spectacular 63,400-gallon (240,000-liter) display with a 39-foot- (12-meter-) long tunnel that is just 8 feet (2.4 meters) high, bringing the giants of the Amazon, such as several huge *Arapaima gigas* (the largest known freshwater fish) with spectacular red tails, red-tailed catfish (*Phractocephalus hemioliopterus*) and silver arowana (*Osteoglossum bicirrhosum*), up close to the visitors. Red-tailed catfish are often sold to aquarists as small juveniles, which then grow to an alarming 5 feet or more. Closer inspection allows viewers to see smaller cichlids, catfish, and rays on the substrate among the sunken trees, while schools of black pacu and flagtail characins (*Semaprochilodus taeniurus*) swim in the water column. Pacu resemble piranha but are actually herbivores. They are another species often acquired by aquarists at a small size but which can grow larger than a dinner plate.

A second display spotlights a large electric eel that can generate an electrical charge of up to 600 volts to stun prey or keep predators at bay. The eel's electrical discharge is audible through a small speaker, enabling visitors to be aware of this amazing ability. A third display houses the South American lungfish (*Lepidosiren paradoxa*), which can breathe air and is known to survive the dry season in burrows, cocooned in a layer of mucus. Several black-spotted stingrays (*Potamotrygon leopoldi*) are located on the substrate, making for interesting companions for the lungfish

Australia Zone

A pair of black swans (*Cygnus atratus*) hailing from southern Australia attract a lot of attention in the open display known as the Australia Zone. The pair generates even more excitement when they swim close to a realistic-looking saltwater crocodile!

The exhibit is also home to barramundi (*Lates calcarifer*), which visitors can view while going down the escalator to the second floor. Also known as a giant perch, this fish is a popular target for anglers in northern Australia.

A single, large freshwater sawfish (*Pristis microdon)*, which is related to sharks and rays, is always on the go in its large display tank. It frequently sweeps past the front window, causing visitors to jump at the sight of its fierce, exposed rostral teeth on its elongated snout. In the wild, this rostrum is sometimes used in a slashing motion to dislodge or stun crustaceans or small fish.

The Archer Fish display of land and water offers the fish a rocky backdrop with mangrove roots as part of its habitat. In addition to the Australian archerfish (*Toxotes jaculatrix*), the display is teeming with spotted scats (*Scatophagus argus*), sebae monos (*Monodactylus sebae*), and silver monos (*Monodactylus argenteus*). All are species of brackish-water fish often encountered by aquarists.

An array of different species of Australian rainbows form a colorful display featuring tall, rocky posts and plants, where visitors can watch adult males jousting with each other as they try to establish dominance.

Africa Zone

The Africa Zone contains the West

Iggy Tavares

■ Albino Siamese sharks stand out against a shoal of tinfoil barbs.

African River, a long, 3-foot- (one-meter-) tall, open-top display containing dozens of dark-striped zebra tilapia (*Tilapia buttikoferi*) in the water column with a large rocky surrounding. The natural aggressiveness of these cichlids is subdued because of their close proximity to each other. Housing cichlids in high populations is a common method aquarists use to keep their aggression limited. The sandy substrate has a lively population of large, active *Synodontis robbianus* catfish that are not troubled by the cichlids, thus making for a great, trouble-free environment.

The Lake Malawi is another long, spectacular, open-top display. It is filled with colorful Malawi cichlids, where the predominant colors are yellow and blue. Although there are mainly mbuna, a few larger haplochromines also reside here. The cichlids are generally peaceful, but adult male Livingston's cichlids (*Nimbochromis livingstonii*) chase each other occasionally, adding a little bit of excitement. Some female cichlids can be spotted carrying developing fry in their buccal cavities, although there is little chance of any survivors.

A much smaller tank of note contains some attractive Senegal birchirs (*Polypterus senegalus*), which prefer the substrate for the most part except when they dash to the surface for air to fill their lungs. Another air breather, a small African arowana (*Heterotis niloticus*), can be seen swimming around freely. The exhibit features another small tank that houses a school of elephantnose fish (*Gnathonemus petersii*), which emit electrical pulses into the water to locate prey. Some refer to this species as freshwater dolphins, since they use a sort of echolocation.

Southeast Asia Zone

Focusing on the tropical rainforest, the Southeast Asia Zone opens with Asian river fish housed in a floor-to-ceiling display featuring giant gouramis (*Osphronemus goramy*) and albino Siamese sharks (*Pangasianodon hypophthalmus*) that create an eye-catching scene. A shoal of tinfoil barbs (*Barbonymus schwanenfeldii*) and some Indonesian tiger fish (*Datnioides microlepis*) complete this nice display.

Another mid-sized tank holds a large number of the smaller blue gourami (*Trichogaster trichopterus*) and a gold-colored variant with a sprinkling of tiger barbs, along with clown loaches that prefer the bottom of the display.

The final Southeast Asia Zone exhibit contains a 2-foot- (0.6-meter-) long Chinese water dragon in a nicely furnished paludarium. The lizard is an extremely popular attraction, especially with photographers.

Cold Water Zone

The Under the Coldwater Stream display features a 29,000-gallon (109,800-liter) tank measuring 39 feet (12 meters) in length. It houses three lively, inquisitive spotted seals (*Phoca largha*) that spend a fair amount of their time playing with a rubber ring. They are also fond of greeting visitors face to face, which makes them quite popular. In the wild, these seals are found in the East China Sea.

Iggy Tavares

■ A Chinese water dragon is a popular display in the Southeast Asia Zone.

Polar Zone

Penguin Encounter houses at least two dozen Humboldt penguins (*Spheniscus humboldti*) and Magellanic penguins (*Spheniscus magellanicus*) that hail from the coasts of South America. Their enclosure is behind a large acrylic panel depicting an iceberg, with steps that enable the penguins to traverse this area when they're not swimming in the 26,500-gallon (100,300-liter) pool. They often swim along the glass panel, much to the delight of visitors. A fun time to see the penguins is during their feeding times, when they receive a meal of anchovies and sardines.

Sea & Shore Zone

A relatively large area of the second floor is devoted to the Sea & Shore Zone, which contains more than a dozen displays. The horseshoe crabs (*Limulus polyphemus*) and small sharks are displayed in a floor-to-ceiling exhibit, extravagantly furnished with a boat. Giant Japanese spider crabs (*Macrocheira kaempferi*) and longspine snipefish (*Macroramphosus scolopax*) share a darkened, medium-sized aquarium. In another tank, a big-eyed soldierfish can be found, along with a white-edged soldierfish (*Myripristis berndti*), red squirrelfish (*Sargocentron rubrum*), and tailspot squirrelfish (*Sargocentron caudimaculatum*).

The anthias reef display is a tall, beautifully furnished aquarium containing artificial corals and buzzing with more than just squarespot anthias (*Pseudanthias pleurotaenia*) and pajama cardinalfish (*Sphaeramia nematoptera*). It also sports a lively, colorful collection of blue damselfish, blue tangs (*Paracanthurus hepatus*), sickletail butterflyfish (*Chaetodon falcula*) and other angelfish, two-barred rabbitfish (*Siganus virgatus*), and even a majestic snapper (*Symphorichthys spilurus*).

The display for lionfish is another tall feature that houses a nice collection of red lionfish

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■ Pajama cardinalfish can be found in the Sea & Shore Zone.

(*Pterois volitans*) with stonefish (*Synancaia vericusa*) on the bottom, as well as conger eels, making it a popular destination for visitors. Stonefish are known as the most venomous fish on the planet, carrying neurotoxin in their dorsal spines. Other smaller displays in this zone include weedy dragons, garden eels, seahorses, and razorfish.

The true star in this zone is the jellyfish section, offering several different species beautifully displayed in five large- to mid-sized darkened aquariums. Black sea nettles (*Chrysaora achlyos*) with their trailing tentacles are featured in an oblong aquarium, while Australian spotted jellyfish (*Phyllorhiza punctata*) have a smaller aquarium.

The last aquarium in this zone, a floor-to-ceiling display, houses a huge number of moon jellyfish (*Aurelia aurita*). Special lighting that gives the jellyfish a pink appearance inspires visitors to take selfie photos in front of the tank.

Deep Ocean Zone

Another ride down an escalator leads to the Deep Ocean Zone, where the first exhibit is the popular Open Ocean. The 87,000-gallon (329,000-liter) aquarium contains a busy collection that includes large whitespotted guitarfishes (*Rhynchobatus australiae*) and cownose rays (*Rhinoptera bonasus*) as well as several other species. Feeding time causes added excitement among the inhabitants as they try to grab their share.

Around the corner, the 510-foot- (155-meter-) long tunnel winds around seamlessly through five separate ocean areas encased in their separate large resin tanks. The acrylic tunnel is just 8 feet (2.4 meters) tall, which brings some of the ocean animals close to visitors, who pass by on the moving walkway or who can hop off the walkway for a longer stay in a particular area or to read the fish identification cards.

With its sand-covered, rocky biotope, the Coastal Reef has a diverse range of fish, from bottom-dwelling zebra sharks (*Stegostoma varium*) and yellow conger eels (*Rhynchoconger flavus*) to larger golden snappers (*Lutjanus johnii*) and juvenile Napoleon wrasses (*Cheilinus undulatus*). There are other species, including a few emperor red snappers (*Lutjanus sebae*), that make for an interesting display. Napoleon wrasses grow very large, in excess of 10 feet. They highlight the diversity of the wrasse family, which contains small fish only several inches long up to fish much larger than an adult human.

Schooling Seas offers a different scenario, as visitors are now faced with a monoculture of hundreds of small schooling fish swimming in tandem almost like a tornado. The scene has a calming, hypnotizing effect that entices visitors to stand around for a few minutes to enjoy the spectacle.

Iggy Tavares

■ A display of black sea nettles is one of several tanks in the jellyfish section of the Sea & Shore Zone.

Grouper Cave, with its many overhanging rocks and caves, offers the perfect habitat for these huge fish. In this display are coral groupers (*Plectropomus leopardus*), potato rockcods (*Epinephelus tukula*), and giant Queensland groupers (*Epinephelus lanceolatus*) that are often being cleaned by tiny bluestreak cleaner wrasses (*Labroides dimidiatus*). Potato cod, or grouper, are endemic to Australia and are often highlighted in underwater nature documentaries.

The ever-popular Shark Cove contains a host of sharks that include black tip sharks (*Carcharhinus melanopterus*), tawny nurse sharks (*Nebrius ferrugineus*), and fearsome-looking sand tigers (*Carcharias taurus*) with their toothy grin and occasional remora passenger. While sand tiger sharks appear menacing, they are actually harmless but simply lack lips to cover their intimidating teeth. Several large rays with shoals of large jacks and smaller but more colorful golden trevally (*Gnathanodon speciosus*), napoleon wrasses, bow mouth guitarfish (*Rhina ancylostoma*), and even some large barracuda add to the spectacle. But there is more, with two gentle-giant green sea turtles (*Chelonia mydas*) that grace this display and like resting near the side for visitors to cuddle up to.

Iggy Tavares

■ A child is mesmerized by a green sea turtle as it glides across the Coral Reef viewing area.

Coral Reef is a huge display with a hilly, rocky biotope covered in realistic-looking colorful corals that make the perfect backdrop for a huge number of fish. This includes large shoals of batfish and longfin bannerfish, but there is a whole host of more-colorful fish, featuring wrasses and different species of surgeonfish, butterflyfish, and rabbitfish—such as the blue tang (*Paracanthurus hepatus*), black-backed butterflyfish (*Chaetodon melannotus*), and foxface (*Siganus vulpinus*)—making for a wonderful finale before taking the elevator up to the first floor where the aquarium shop and the exit are located.

Memorable Exhibits

I was impressed by several exhibits at Shanghai Ocean Aquarium, which is home to some of the biggest and best specimens of electric eels, arapaima, and the Chinese giant salamander.

Visitors should note that the aquarium's one-way policy with one-way escalators prevents them from returning to previously viewed exhibits. To escape crowds, it is best to avoid going to the aquarium at midday, when hundreds of schoolchildren sometimes visit. After enjoying my two hours there, I believe Shanghai Ocean Aquarium is well worth a visit.

Shanghai Ocean Aquarium
1388 Lujiazui Ring Road
Pudong New Area,
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www.sh-aquarium.com/en/html/

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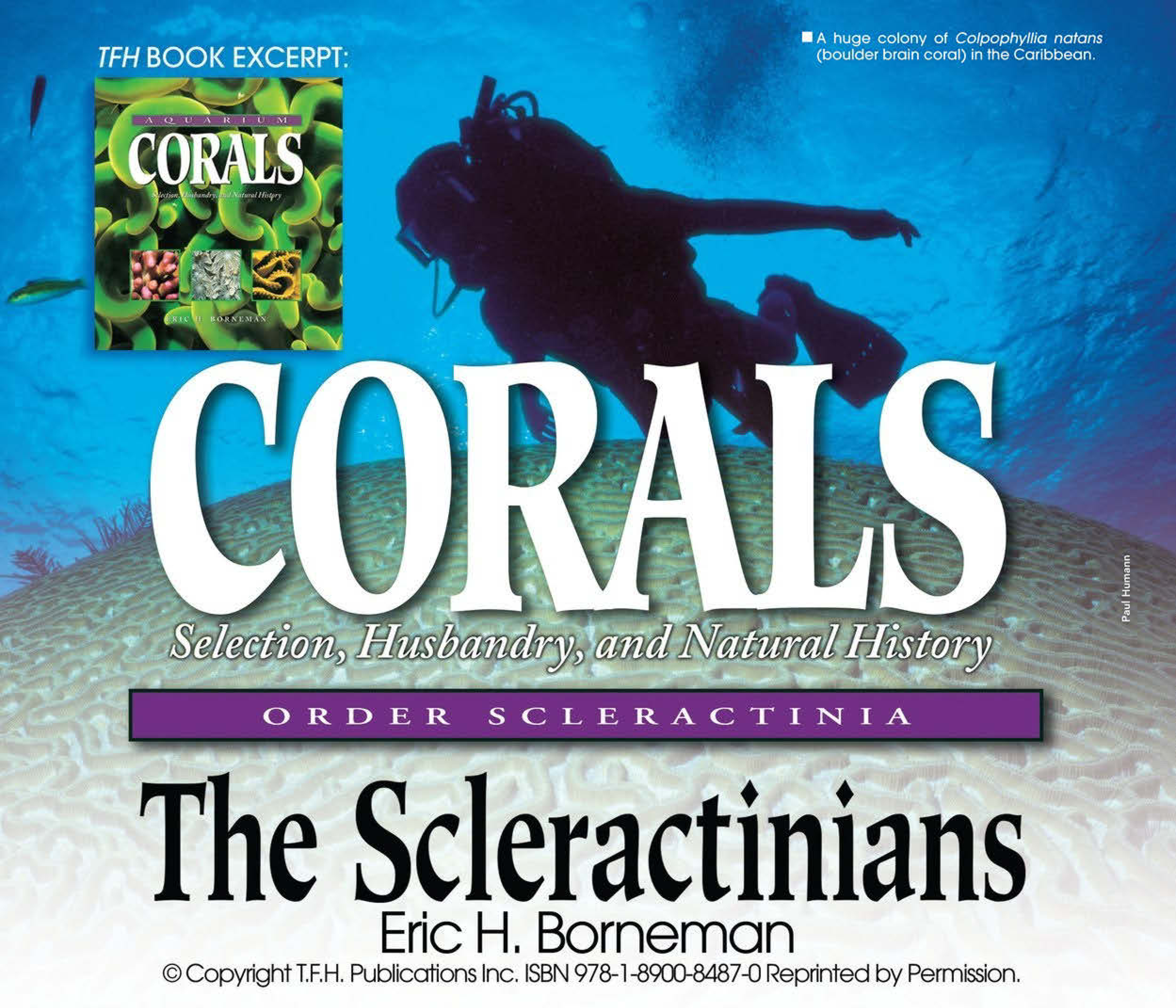

A huge colony of *Colpophyllia natans* (boulder brain coral) in the Caribbean.

Paul Humann

CORALS

Selection, Husbandry, and Natural History

ORDER SCLERACTINIA

The Scleractinians

Eric H. Borneman

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Stony corals are the primary builders of the great reef structures of the tropical seas—and the animals the world thinks of as "true corals." They range from massive domes of boulder brain coral (*Colpophyllia natans*), to thimblelike *Caryophyllia* species and other tiny, solitary corals that live in near darkness at depths down to 1,000 m (3,000 ft.) or more. In between are thousands of species that can appear as vast, impenetrable thickets of staghorn-type *Acropora* corals, fields of leafy *Pavona cactus*, or even corals hidden in obscurity, such as the delicate, brittle little colonies of *Anacropora* that survive in the turbid waters of muddy, shallow areas.

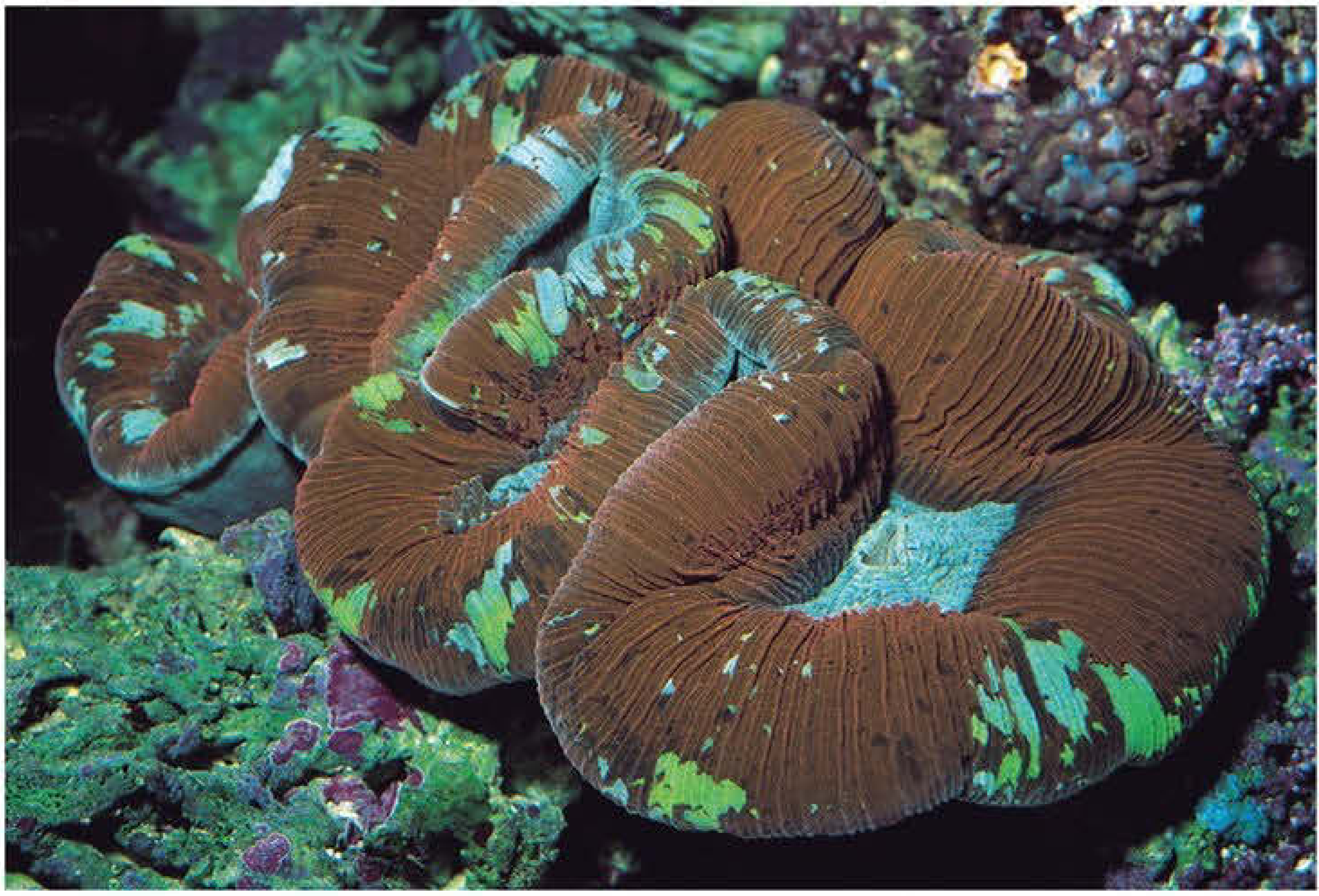
Belonging to the Subclass Hexacorallia, the stony corals, or Scleractinia, are characterized by having polyps with tentacles that number six or multiples of six, as well as a solid calcareous skeleton secreted by the polyps.

Although highly variable, stony corals often possess distinctive growth patterns, shapes, and colors, with the polyp itself sometimes displaying unique characteristics. Taxonomy to the species level in the stony corals can be quite apparent, given sometimes obvious skeletal clues that are clearly visible despite the polyp's tissue. In other stony corals, species-level distinctions can be cryptic at best, and the use of tissue samples, microscope examination or even DNA analysis may be needed to make a positive identification. In many cases, identifying stony corals to the genus level will be the best that aquarists can hope to do.

FAMILY Trachyphylliidae Verrill, 1901

Pacific Genus: *Trachyphyllia.*

Trachyphyllia geoffroyi is very common and popular among aquarists, while *Trachyphyllia radiata* (formerly *Wellsophyllia*



Scott W. Michael

■ *Trachyphyllia geoffroyi* (open brain coral): easily identified, solitary corals.

radiata) is both an unusual import and reported by some sources to be rare in nature. *Trachyphyllia radiata* has a colony shape different from *T. geoffroyi* even in juvenile stages, although the fusion of walls in *T. radiata* becomes more distinct in adult forms.

GENUS *Trachyphyllia* MILNE-EDWARDS AND HAIME, 1848 (track'-ee-fill'-ee-ah)

Common Species: *T. geoffroyi, T. radiata.*

Common Names: *T. geoffroyi*: open brain coral, folded brain coral, crater coral. *T. radiata*: Pacific rose coral, open brain coral.

Identification: *Trachyphyllia* are unique solitary corals (occasionally colonial) with a flabello-meandroid skeleton. The free-living species (*Trachyphyllia geoffroyi*) may be quite convoluted with wide valleys and channels, though small specimens with a single folded channel have the most common shape and are most often seen in the aquarium trade. Their septa are thin, smooth, numerous, and very regular, imparting an even, ruffled look to the polyp tissue above. Paliform lobes are present. The bases of *Trachyphyllia* are normally cone-shaped, which helps specimens bury themselves in soft bottoms.

When *T. geoffroyi* corals are found (rarely) attached to hard substrates on the reef, the base does not have this characteristic shape. Attachment scars are often present. Polyp tentacles usually appear along the outer margin of the oral disc at night, occasionally during the day if food is present.

Trachyphyllia radiata are distinct in having fused walls of their adjacent and deep valleys. They are rounded and typically far more "folded" and meandroid than their relatives, though the septa and polyps look very much alike. *Trachyphyllia radiata* corals are always attached to hard substrate and are not reported as ever being free-living (PICHON, 1980).

Natural Location: *Trachyphyllia geoffroyi* are normally found on outer-reef margins and inter-reef areas with other free-living corals such as *Fungia* and their relatives. They are usually attached while immature and only become detached and free-living after some time. Some can be found on muddy bottoms in protected lagoons, in seagrass beds, and on sandy bottoms near the reef base. The more complex growth forms may be indicative of a coral needing protection from encrusting or boring organisms.

The natural locations of *T. radiata* are predominantly unknown—they are reportedly found in deeper water and under shaded overhangs.

Colors: *Trachyphyllia geoffroyi* are highly fluorescent corals that absolutely glow under actinic lighting. The polyps are brightly colored and most commonly green, red, pink, or brown. Blue morphs are rare and very beautiful. Walls and valleys may be of contrasting shades. The tissue above the septa may also be tinted or shaded in contrasting colors to give a finely striated appearance. The colors of *T. radiata* are similar to those of *T. geoffroyi*, often a very attractive green, although brown and drab tones are also common.

Captive Care: In the aquarium, *Trachyphyllia* are neither easy nor exceptionally difficult to maintain. Recession and failure of expansion are common problems. Some also tend to bleach, while others may be subject to tissue peeling. Corals must expend energy to remove accumulations of sediment and sand from their surfaces, and captive specimens can become weakened if they must constantly cope with aquarium substrate or debris covering them. Certain fishes, such as substrate-sifting gobies (e.g., *Valenciennea* species) may not be welcome additions in aquariums housing *Trachyphyllia*.

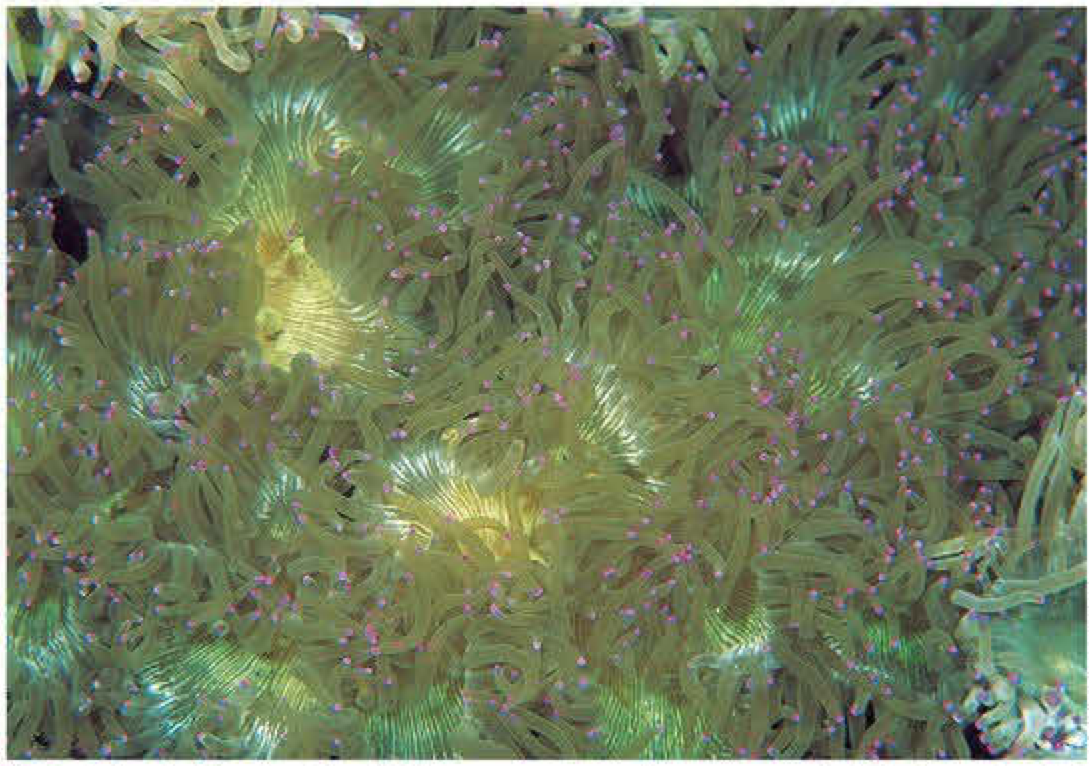
Red-colored *Trachyphyllia* reportedly come from shaded or turbid locations and require less light than the light-loving green and brown morphs. Iodine may be important in maintaining the light tolerance and the coloration of these corals and may also help to prevent recession. (This is an anecdotal observation by other authors and aquarists. As far as I am aware, there is no evidence to support this view.)

Water flow around *Trachyphyllia* should be moderate to help assist the coral in washing away debris that accumulates in its deep valleys and that may tend to cause localized tissue necrosis. *Trachyphyllia*, though strangely hardy in some aquariums, are relentlessly finicky in others. Furthermore, these corals seem prone to a rapid disintegration of tissue (suggestive of rapid tissue necrosis seen in small-polyped corals), usually soon after acquisition. It is probable that *Trachyphyllia* do not tolerate stress well, and the combination of collection, shipping, handling, and changes in water chemistry are likely responsible for their oft-reported early demise. They are also quite susceptible to the chemicals released by certain soft corals—most frequently reported are encounters with *Sinularia* species.

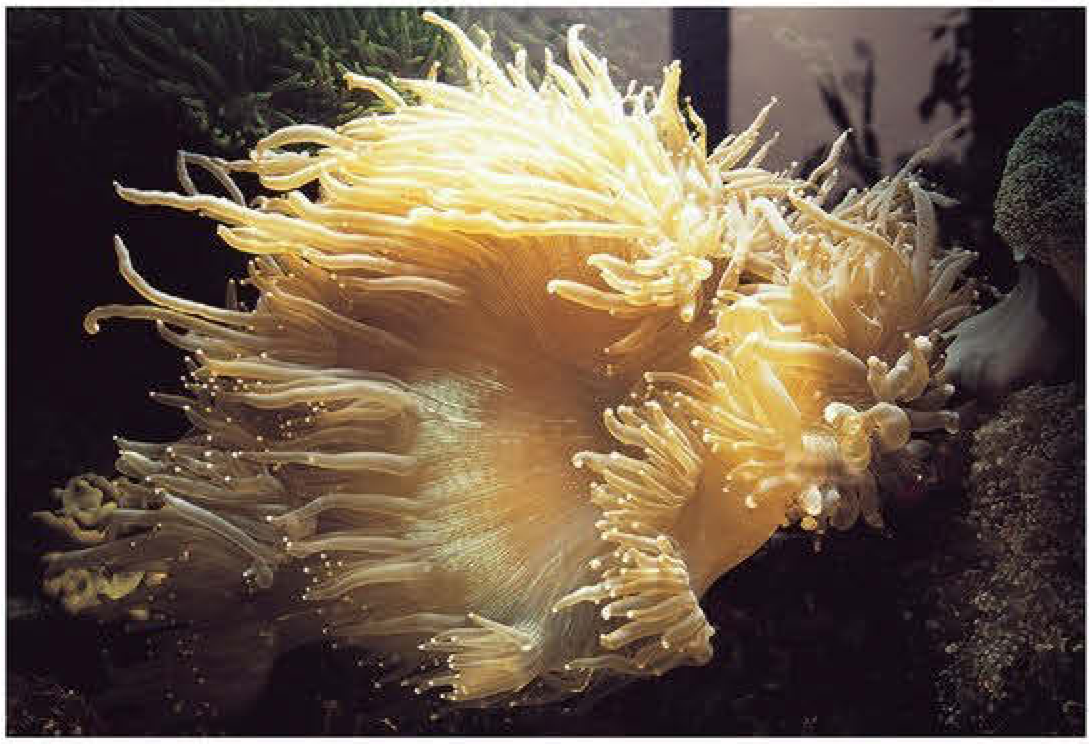
Trachyphyllia may benefit dramatically from occasional feedings of vitamin-soaked foods. They are quite aggressive feeders and are even reported to be piscivorous (fish eating).

In terms of captive reproduction, polyp buds are frequently reported arising from the lower margins of the corallum.

Because they tend to attach to reef structures more often, *T. radiata* corals may have less difficulty with sediment-caused



■ *Catalaphyllia jardinei* (elegance coral): group of pink-tipped wild colonies.



■ *Catalaphyllia jardinei* (elegance coral): captive colony warring with neighbors.

problems. Their lack of bright colors indicates perhaps a broader tolerance of lighting conditions. Nonetheless, reasonably bright and indirect light have seemed appropriate for most reported examples in captivity.

Special Information: *Trachyphyllia* are well known for being nipped at or snacked on by certain tangs and angelfish species. Why this coral is so comparatively "tasty" to these fishes is not known.

Trachyphyllia radiata was formerly *Wellsophyllia radiata*. The *Wellsophyllia* genus has been eliminated (Borel Best and Hoeksema, 1987; Veron, 1989, 1992, 1993).

FAMILY Euphyllidae Veron, 2000

Including many perennial favorites among reef aquarists, the Family Euphylliidae consists of five genera of corals with similar skeletons but diverse appearance. They are some of the most interesting and unique stony corals known.

Indo-Pacific Genera: *Catalaphyllia*, *Euphyllia*, *Nemenzophyllia*, *Physogyra*, and *Plerogyra*.

All of the above genera are commonly available in the aquarium trade, despite being generally uncommon in nature. Many are typically found in shallow-water environments, but some occur in moderate to deep reef levels.

All members of the family are zooxanthellate, colonial, and are found in the Indo-Pacific.

These corals were formerly placed in the Family Caryophylliidae. In his revision of the Family Euphyllidae, Veron moved *Gyrosmilia*, *Eusmilia*, and *Montigyra* to the Family Meandrinidae.

GENUS *Catalaphyllia* Wells, 1971
(cat-al'-ah-fill'-ee-ah)

Common Species: *C. jardinei*.

Common Names: elegance coral, elegant coral, wonder coral.

Identification: These beautiful corals have a skeleton that is almost identical to the flabello-meandroid species of *Euphyllia*. However, they have a cone-shaped base that helps them bury into soft bottoms where they are found in nature. The living polyp is determinant and is conspicuously different from any other coral. Polyps are extended during the day, exposing their vast oral disc to the light. The tissue is almost fully retractable, but usually remains partially expanded at night. They are so distinctive that further descriptive identification is unnecessary. Their skeleton becomes more meandroid as it grows.

Natural Location: *Catalaphyllia* bury their base in soft substrate, and their hugely inflated polyps and tentacles wave on the bottom, making them all but indistinguishable from an anemone.

Like *Trachyphyllia*, *Catalaphyllia* are often temporarily attached to substrate while young, but break away to become free-living when mature. *Catalaphyllia* are common in lagoonal areas with soft or muddy bottoms (though they may be found in other areas), and in inter-reef areas where they commonly share space with fungiids, seagrasses, and other lagoonal flora and fauna.

Colors: The colors of *Catalaphyllia* are nothing short of extraordinary. Their fluorescent qualities under actinic light are breathtaking. Bright fluorescent green with contrasting cream tentacles is a common variation. Brown examples are also common. More rarely, very desirable lime green specimens with blue-, orange-, or purple-tipped tentacles may be found. Contrasting colored tips on the tentacles are common; the species may have branched or bulb-shaped tips, as well.

Captive Care: *Catalaphyllia* are regularly offered at aquarium stores. They prefer a gentle current that does not lift them out of the substrate. Specimens are best placed on soft bottoms, since the dramatic tissue expansion can cause abrasion to the polyp if placed among live rock. Such abrasion can lead to recession or brown jelly infections. These corals can occasionally "bail out" of their skeletons, and may do so in response to poor water parameters or sudden changes in lighting and water quality. This is not a normal form of reproduction, but seems to be an escape reaction. The polyp will fortunately begin to calcify again, if conditions are appropriate. Small buds, similar to those of *Euphyllia*, are commonly produced in captive specimens with surprising regularity. They seem to possess a willingness to "swap" zooxanthellae in response to changed lighting, leading to the presumption of maladjustment, disease, or impending death. Remaining contracted, sometimes for months, they may suddenly "snap out of it" and again expand normally with subtle to dramatic color differences. They are sensitive to the presence of many soft corals, and may even be adversely affected by *Caulerpa* algae. They succumb to infection easily, are prone to bristleworm irritation, can be easily punctured or torn when inflated, may recede in aquariums with significant filamentous algae growth, and may

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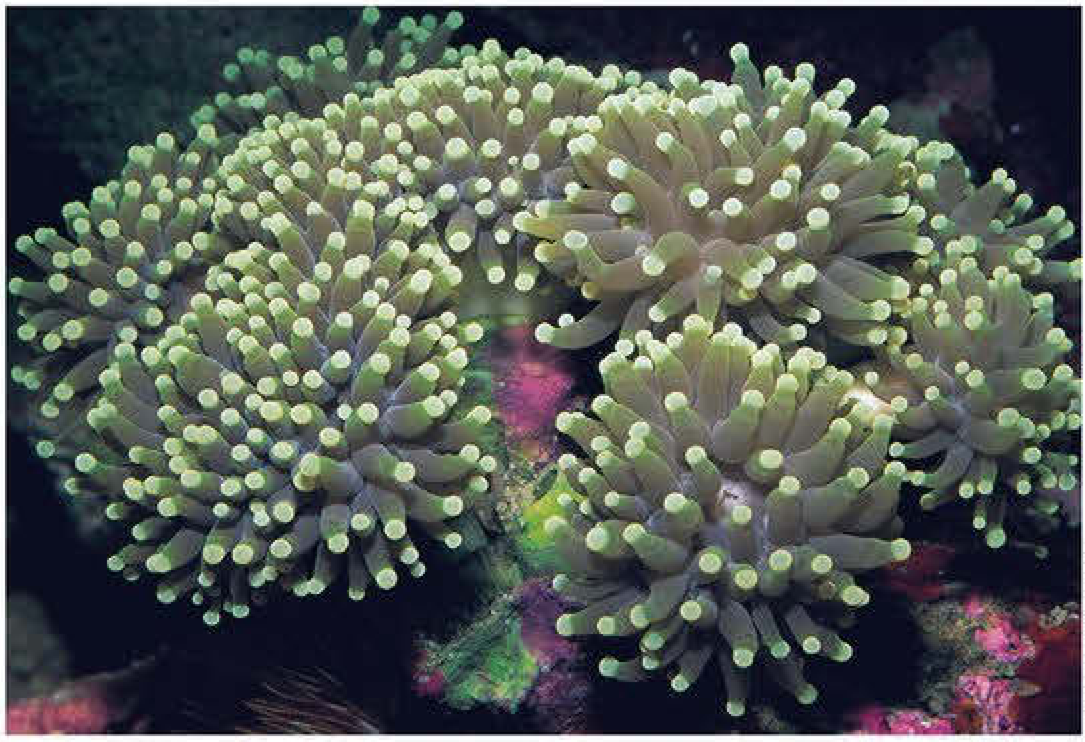
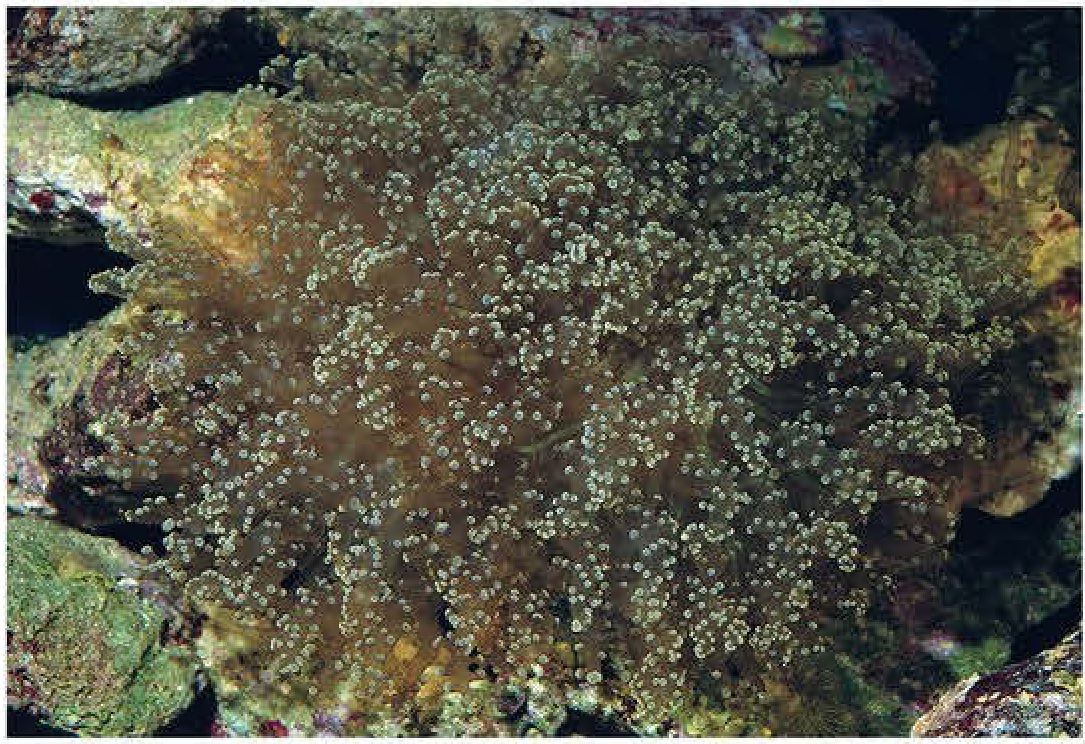


Scott W. Michael

■ *Euphyllia glabrescens* (torch coral): skeleton composed of lightweight tubes.



Scott W. Michael

■ *Euphyllia divisa* (frogspawn coral): can grow into large, spectacular colonies.

require dietary supplementation to maintain long-term health. In short, they are quite frequently problematic.

Many years ago, *Catalaphyllia* were among the easiest corals to maintain, but the majority today are not surviving. They adopt an abnormal appearance, with an initially swollen polyp body and shriveled tentacles. Eventually, the polyp shrinks tight against the skeleton and succumbs by recession or opportunistic invasion. No environmental or treatment protocol seems to help. I cannot help but feel that collection, shipping, and transitional care has played a significant role in the number of injured or sick examples, and contributes to these recent failures.

Special Information: *Catalaphyllia* are willing feeders, and occasional feedings are encouraged. The strong nematocysts present in their many tentacles have the potential to ensnare small fishes, and they are certainly capable of raising welts on hobbyists' forearms and hands. In fact, the degree these corals can expand, coupled with their strong stinging cells, make any nearby coral susceptible to severe damage. Despite the formidable tentacles of *Catalaphyllia*, when near *Euphyllia ancora*, the latter is the dominant species. Even more surprising, I once witnessed damage to a *Catalaphyllia* after a specimen of *Pachyseris* (a virtually nonpolyped stony coral) fell on top of it with no collateral damage to the *Pachyseris*. The aggressive hierarchies in the corals are remarkable (and not always intuitive).

Certain clownfishes may adopt *Catalaphyllia* as a surrogate anemone. This may be detrimental to the coral: they are often rendered incapable of full expansion, become irritated, and may perish.

Collection Impact: *Catalaphyllia* is a solitary coral that must be taken in its entirety for collection. It is heavily collected and there are concerns that it may be subjected to local overharvesting.

GENUS *Euphyllia* Dana, 1846 (yoo-fill'-ee-ah)

Common Species and Common Names:

E. ancora: hammer coral, anchor coral.

E. cristata: grape coral.

E. divisa: frogspawn coral, octopus coral.

E. glabrescens: torch coral, branching hammer or branching anchor coral, pom-pom coral.

E. paradivisa: branching frogspawn coral.

E. parancora: branching hammer coral or branching anchor coral.

Identification: A unique feature of *Euphyllia* is that the identification of species is based to a large degree on the shape of the polyp and is not exclusively dependent on the skeleton. The colonies are often large and flabelloid, phaceloid, or meandrophaceloid, depending on the species. The corallite walls are distinct, forming the outer edges of the colonies. Septa are very prominent, especially noticeable since the polyps of the species are completely retractable. The polyps are long and flowing and usually extend fully during the day and partially at night.

Euphyllia ancora is distinguished by having a solid flabellomeandroid skeleton with T-shaped or anchor-shaped tentacle tips. *Euphyllia parancora* is a phaceloid branching colony with T-shaped or anchor-shaped polyp tips extending from the ends of each branch. *Euphyllia divisa* has a slightly more solid skeleton than *E. ancora*, but is nearly identical in shape and form. Its polyps, however, are branched at the ends and have masses of round tips. This lends an appearance indicative of its common name, Frogspawn. *Euphyllia paradivisa* has a phaceloid branching skeleton with polyps similar to *E. divisa*. *Euphyllia glabrescens* has a phaceloid branching skeleton with polyps that have a single rounded tip and compact corallites, with inward projecting septa that do not extend much above the corallite wall. *Euphyllia cristata* and *E. yayamaensis* also have single round-tipped polyps and a phaceloid skeleton, but their corallites are more opened, and their larger septa project outward and above the walls.

Natural Location: As may be apparent from the multitude of common names for this genus, *Euphyllia* represent a significantly large fraction of aquarium imports. These corals are very common in the hobby, yet are surprisingly less than common in nature. None are considered to be hermatypic, though all are symbiotic.They occur in somewhat diverse habitats, but are most common on reef slopes in large colonies often clustered together on the same reef. *Euphyllia* are often found in deeper waters than many other species available within the hobby.

Colors: Most *Euphyllia* are pale brown or green, with a translucent quality to the tentacles. Pinkish brown to pink is relatively common. Fluorescent aqua and blue colonies are rare, but striking. Often, their tentacle tips may be of a contrasting shade to the tentacle "stems." This color trait is especially common in *E. ancora*.

Jack Wattley

Discus

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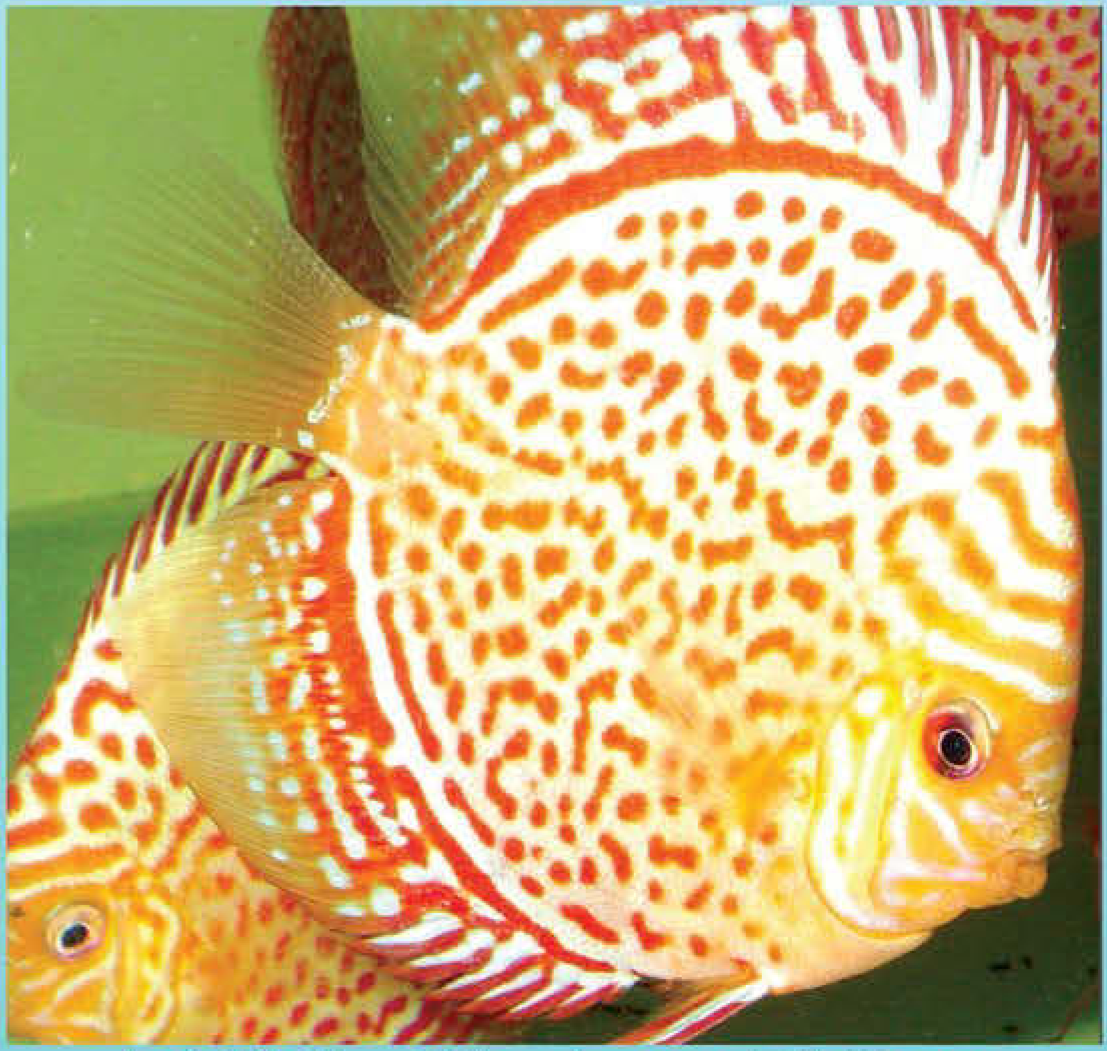

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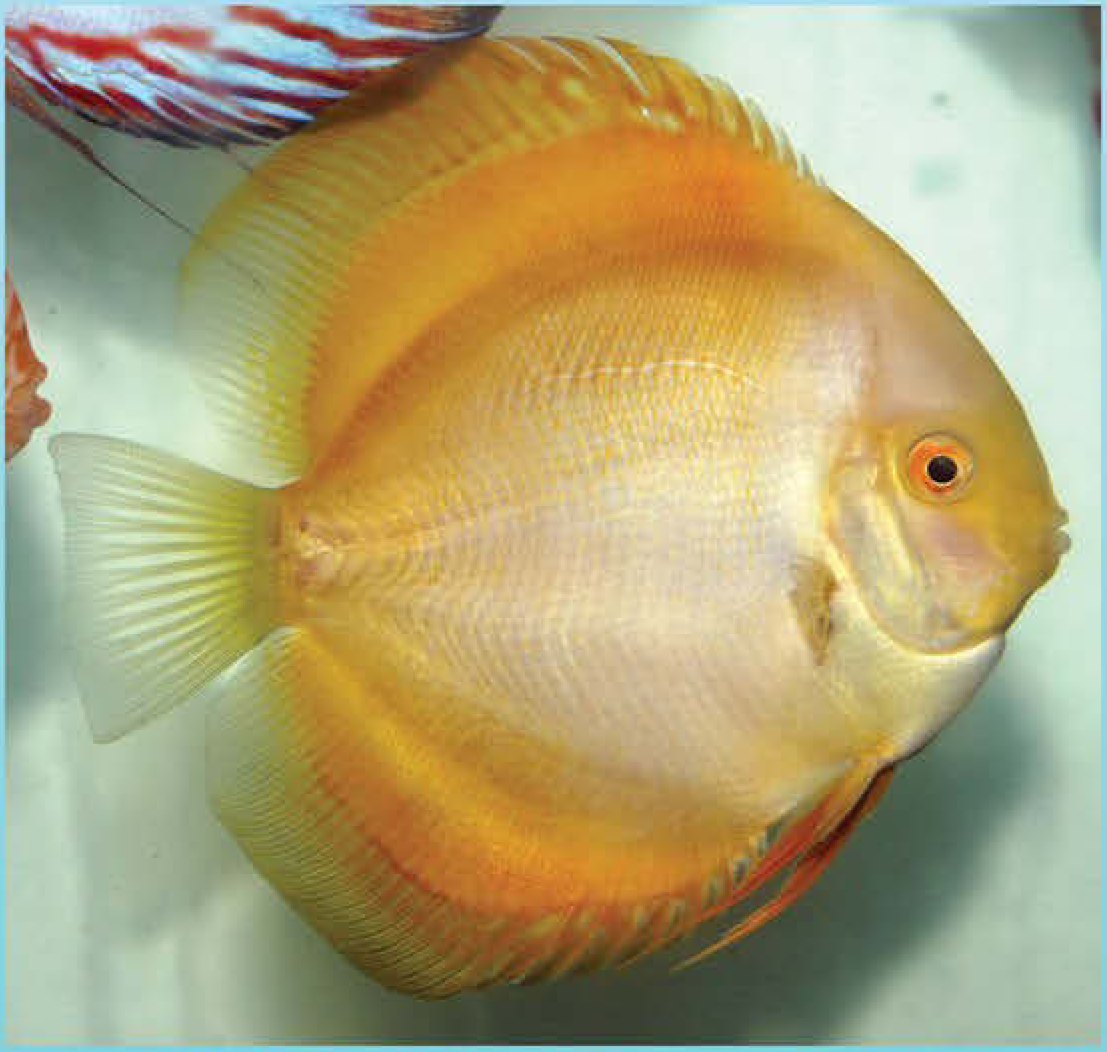

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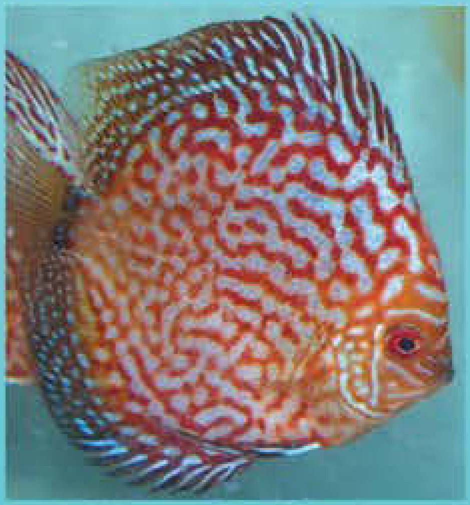

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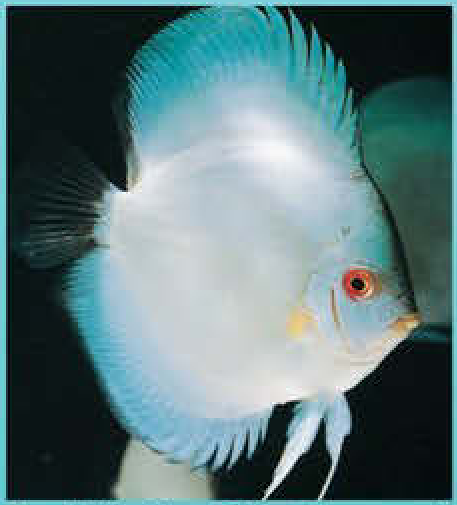

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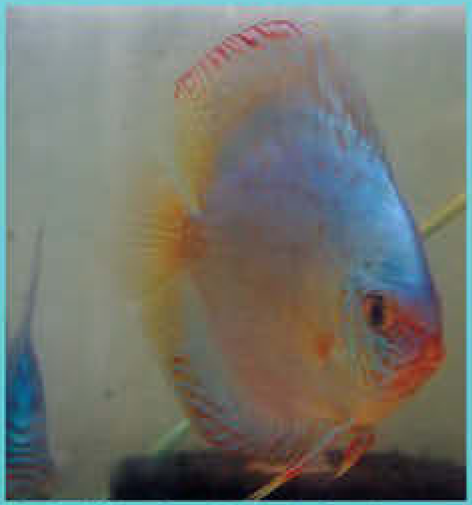

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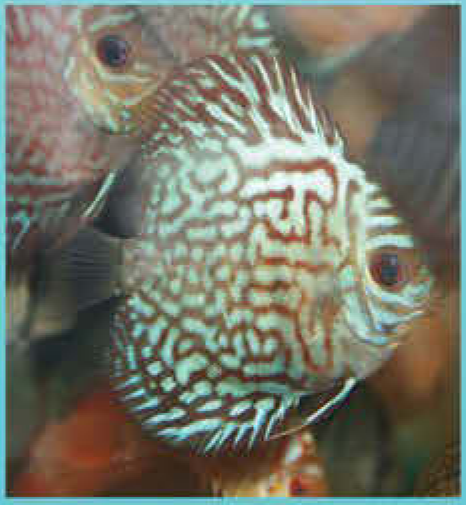

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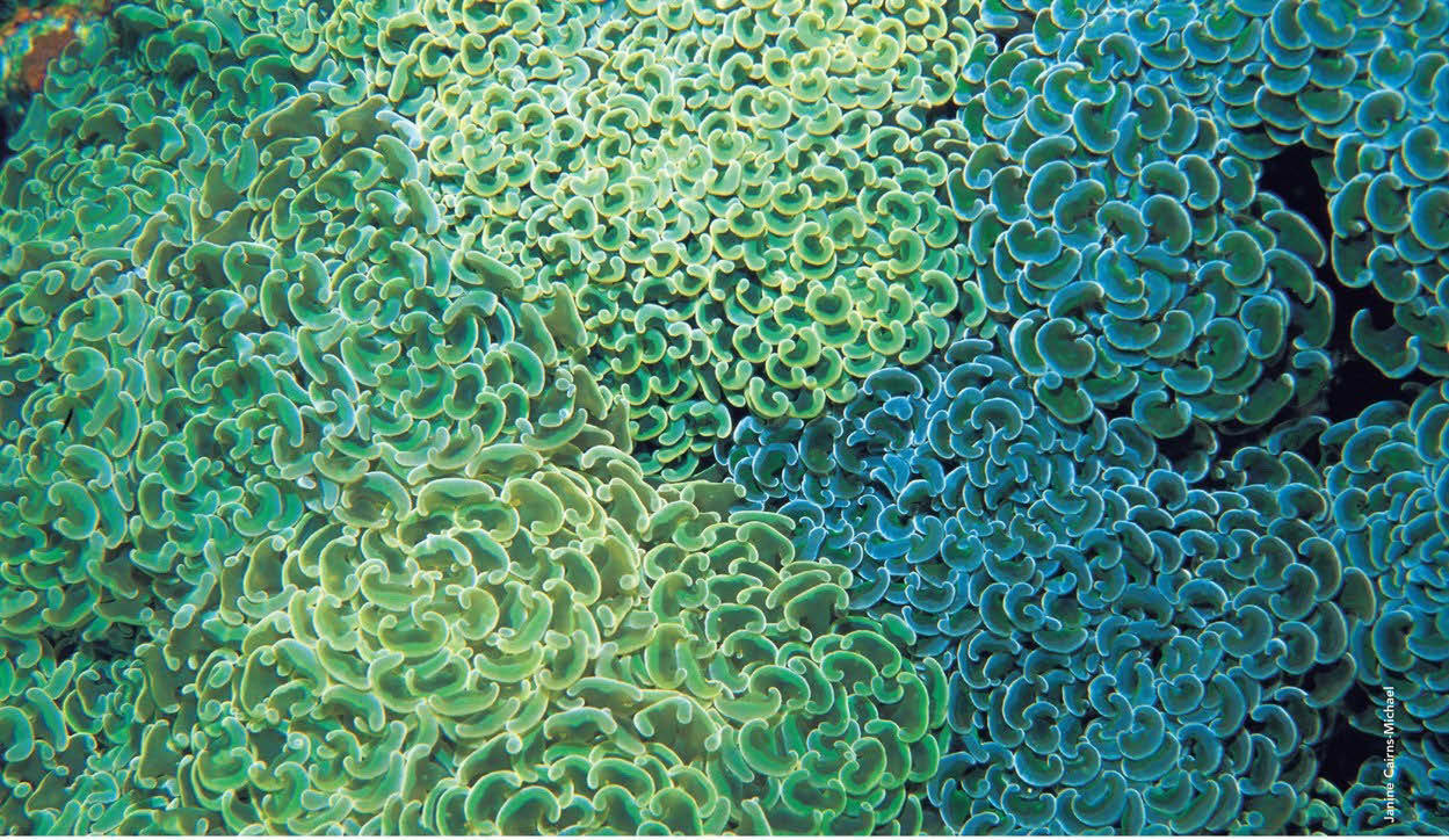

Janine Cairns-Michael

Euphyllia ancora (hammer coral) and *Euphyllia parancora* (branching hammer coral): observers worry that these corals may be overcollected in some areas.

Captive Care: In the aquarium, *Euphyllia* are good water-quality monitors. Though quite hardy, their failure to show good polyp expansion can indicate less-than-perfect water parameters.

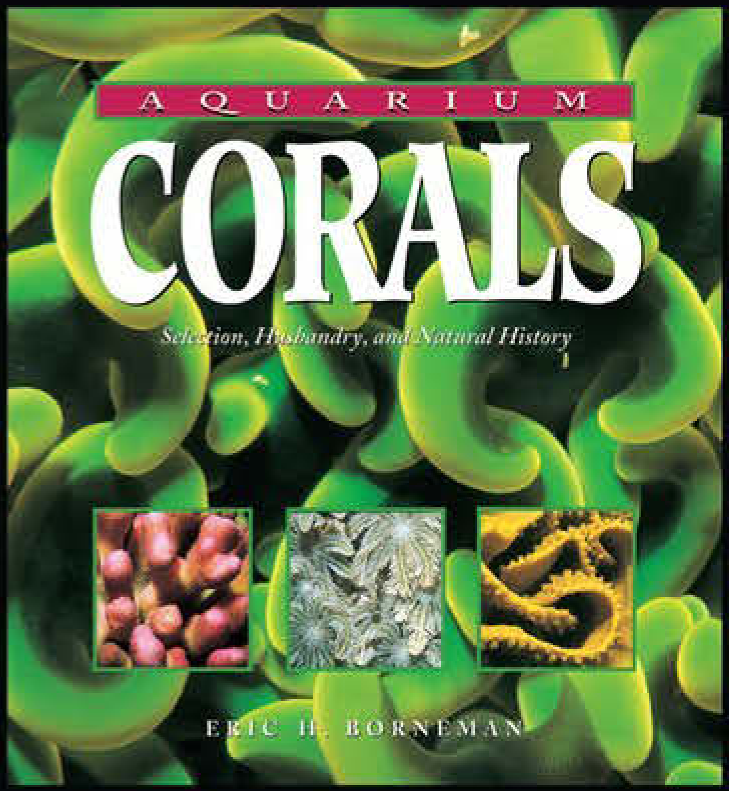
Colonies can tend to get brown jelly infections, and recession from the margins toward the center is also common. They seem unusually sensitive to extensive collections or large specimens of certain soft corals, notably certain *Sinularia* species. Budding via small groups of polyps with tiny calcified skeletons is common in captivity especially with *E. divisa*, *E. paradivisa*, and *E. glabrescens*. Like *Caulastrea*, the death of any individual branch of any of the phaceloid *Euphyllia* species does not affect the colony as a whole. They prefer somewhat turbid locations in nature and will thrive with bright indirect light and a gentle current. Exceptionally strong water movement induces the formation of sweeper tentacles and should be avoided. Such forceful currents also prevent good tissue expansion, though constant gentle currents seem to enhance calcification rates dramatically. *Euphyllia* seem widely tolerant of lighting intensities but, strangely, seem to expand best in areas of the tank where the multiple parameters of water flow, lighting, and perhaps passing food sources are optimal.

Some degree of trial and error in placement may be needed to determine their ideal location. All species accept food willingly, and their green, brown, or pinkish green tentacles quickly snatch passing food. It is quite astounding to watch fairly large food items slowly disappear into the mass of waving tentacles.

Special Information: The formation of long and very powerful sweeper tentacles is a daily occurrence with most *Euphyllia* species. The sting of *E. ancora*'s sweeper tentacles can actually be painful, and very few corals survive an aggressive attack by members of this genus. It has been reported on several occasions that sweeper tentacle tips of *E. ancora* may sometimes stick to substrate and break off, where they can then form new colonies. If this is true, it would be a totally novel and hitherto undocumented form of asexual reproduction in the cnidarians and should be carefully verified. Furthermore, sometimes these tips are readily broken off in currents, having been completely pinched off by the animal prior to release. This does not seem to occur in stressed or weak corals, and it may be either an unreported form of asexual reproduction or a generalized defense mechanism. Tentacle tips with swollen acrospheres are more likely to become detached, and the drifting tips, completely sealed like neutrally buoyant water balloons, stick onto virtually any surface they encounter, often creating substantial damage to other sessile life, especially other corals.

Collection Impact: Unfortunately, questions arise about the wild harvest of *Euphyllia*. Their beauty and success in captivity is alluring, yet they are not reported as common in the wild, and the means of collection involves hammering or chiseling free pieces of larger colonies. Some sources report that regeneration occurs within two or three years, but there are concerns that imports of *Euphyllia* represent a disproportionately large number of corals collected for the aquarium trade. Again, it is important to remember that while the aquarium hobby as a whole is not responsible for significant degradation of natural reefs, we must understand our role as leaders and stewards of the reef, rather than merely takers.

Aquarium Corals by Eric H. Borneman



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Snorkeling in Cuba

John Robertson

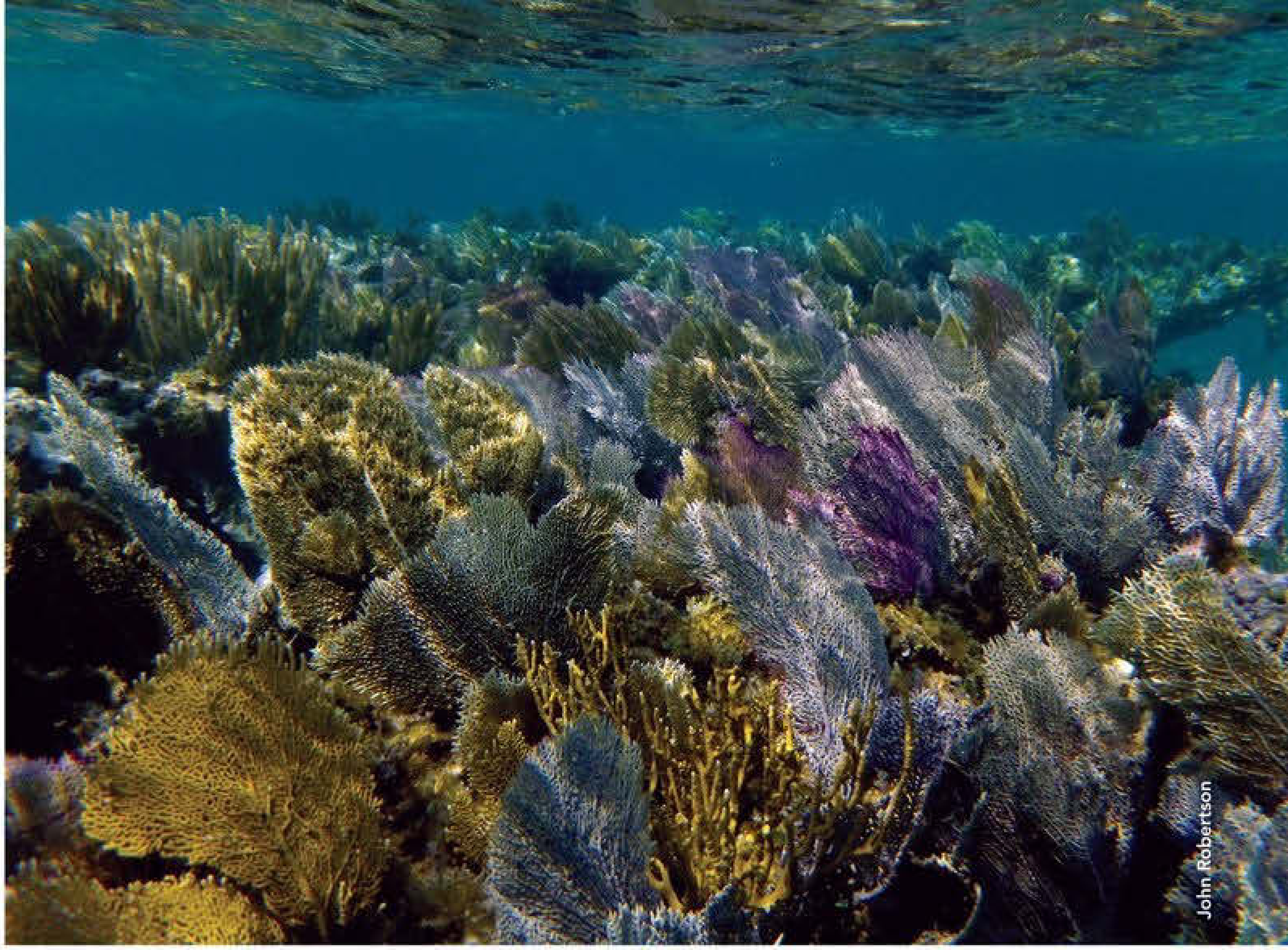
John Robertson

A shoal of rosy red soldierfish gathers close to the cover of a reef overhang.

Playa Pesquero is a long tourist beach of beautiful white sand set in a protected bay on the northern coast of eastern Cuba. The area, with its shallow waters off the beach, is known for its excellent snorkeling conditions and abundance of fish that are endemic to the Caribbean Sea.

On my first day in Cuba, I discovered that the main reef was 100 yards (91 meters) from the shore and far too deep for snorkeling. The visibility closer to shore was poor, but that was due to the hot, breezy weather that—although enjoyed by sunbathers—raised the fine sand beneath the waves.

The water clarity varied by the hour and location. At times, visibility was less than 5 yards (4.5 meters), but often it was much better. I soon discovered that there was no need to venture out too far, as there were many wonderful fish close to shore.



■ Fields of sea fans and gorgonians create a beautiful environment for snorkeling.

John Robertson

■ The Atlantic blue tang (*Acanthurus coeruleus*) is a definite eye-catcher.

John Robertson

The seascape at Playa Pesquero is very varied, ranging from wide expanses of white sand to large areas of flat rocks and boulders. There are also sections of large, isolated corals rising from a substrate of coral rubble. These zones extend for about 50 yards (46 meters) from the shore but are never much more than 6 feet (2 meters) deep.

Rocky Shallows

The shallowest waters, which measure less than 3 feet (one meter) in depth, are teeming with small fishes that include wrasses, damselfishes, blennies, and the juveniles of such species as grunts, surgeonfishes (tangs), and angelfishes.

Wide areas of flat white rock are covered with sediment and punctuated with craters. Many fish, particularly damsels that glitter in yellow and blue, take refuge underneath these flat slabs. The damsels tend to drive off the small surgeonfishes that compete for the algae resources, which thrive under the brilliant tropical sun. It's very likely that the damsels had chosen these areas as spawning grounds.

Aquarists know that this territorial nature makes damsels, despite their beauty, too feisty for many home aquariums. While I was snorkeling, I was unable to get a good photo of them. Whenever I got close to them, the tiny damsels would charge at my camera with lightning-fast speed and retreat just as quickly into a small hole or recess. Their determination and courage was remarkable as they attacked me over and over again, never tiring even as they drove off many other fishes.

Several species of blenny make their homes in nooks and crannies, while small wrasses are constantly on the move, such as the striking blue heads (*Thalassoma bifasciatum*), which are like tiny torpedoes in perpetual motion. Many wrasses change dramatically as they grow. The intermediate form of the puddingwife wrasse (*Halichoeres radiatus*) is a lovely sight that does not deserve such an unflattering name.

There are plenty of amazingly camouflaged scorpionfish (*Scorpaenidae* spp.) lying in wait, and on one occasion, I approached an adult specimen that was approximately 18 inches (46 cm) long. I am not sure if I was more shocked by the flashes of its boldly striped tail—which is normally hidden—or by its sudden burst of speed as it dashed away to settle a few yards away from me, becoming virtually invisible once more.

Gentle Bay

Venturing out a little further, I discovered large areas of patch reef that were 6 to 8

John Robertson

■ Blue-striped grunts patrol the bay.

feet (2 to 2.5 meters) deep, with islands of large brain corals as well as fields of sea fans and gorgonians rising above a complex terrain of coral debris. Visibility, though still variable, was generally better than in the shallowest waters and at times reached 10 to 15 yards (9 to 14 meters).

This was the richest habitat, with the species seen in the shallows also in abundance here. Brilliant Atlantic blue tangs (*Acanthurus coeruleus*) and striped doctor fishes (*Acanthurus chirurgus*), with both species measuring up to a foot (30.5 cm) long, were joined by impressive yellow-tailed snappers (*Ocyurus chrysurus*) that reached 18 inches (46 cm) in length and an occasional shoal of 20 to 30 fish that appeared out of nowhere.

Many tourists unfortunately attract the fish with offerings of bread or bananas, and this caused them to follow me in hopes of receiving such treats from me. This is a bad practice, as these food items are not beneficial to a fish diet.

Tiny neon gobies (*Elacatinus oceanops*) offered cleaning services from the security of the projecting corals, while smaller groups of fluorescent blue chromis (*Chromis cyanea*) boldly glided above the corals. Shoals of various grunts (*Haemulon* spp.)—French, blue-striped, and tomtate—and rosy red soldierfishes (family Holocentridae) huddled close to cover. Coneys (*Cephalopholis fulva*) retreated at my every approach, and I spotted at least three species of morays sliding through the rocks and rubble to take cover under substantial coral structures. Wrasses cruise here too, including the lovely spanish hogfish (*Bodianus rufus*).

John Robertson

■ A moray eel searches for a hiding place away from the snorkeling intruder.

Angels and Lionfishes

Angelfishes are the stars of the Caribbean reefs, and there were stunning French angels (*Pomacanthus paru*) of all growth stages except adult to be seen. One individual was particularly bold and literally posed—showing me one side, then the other—so I could witness its striking bands of youth on glorious display. It also had subtle golden edges to every scale, the first signs of maturity.

There were also numerous rock beauties (*Holacanthus tricolor*) and an occasional juvenile queen angel (*Holacanthus ciliaris*), but I was disappointed that I didn't encounter an adult French or queen angel.

The large number of lionfish (*Pterois* spp.) in the area was something I found disturbing. They were sheltering under many large rocks, usually two and three at a time. As beautiful as they are, lionfish—being native to the Indo Pacific oceans—have no place in this region.

I couldn't detect which species they prey upon nor whether their presence is having a serious impact on populations of other fishes. I saw many grunts, surgeons, and wrasses that didn't seem to be impacted. However, I didn't notice a single cardinalfish, which led me to wonder if these nocturnal feeders are being depleted by the invading lionfish.

Deep Water

Swimming another 50 yards (46 meters), I reached the deeper waters. Dark rocks rose jagged and unpredictable from the pale sand below, like a mountain range on an alien planet. The visibility is generally better in the deeper water, but it's not a good idea to be alone so far from shore.

The fauna here was similar to that of the previous zones, but the yellow-tailed snappers and shoals of surgeonfish were even more numerous. My wife went scuba diving nearby and reported sighting a 6-foot- (2-meter-) long reef shark (*Carcharhinus melanopterus*) that appeared disinterested while gliding past her.

Large groupers, snappers, and stoplight parrotfish make this area interesting, but the vista of rocky outcrops encrusted with yellow barrel and red vase sponges are a more impressive attraction to many snorkelers.

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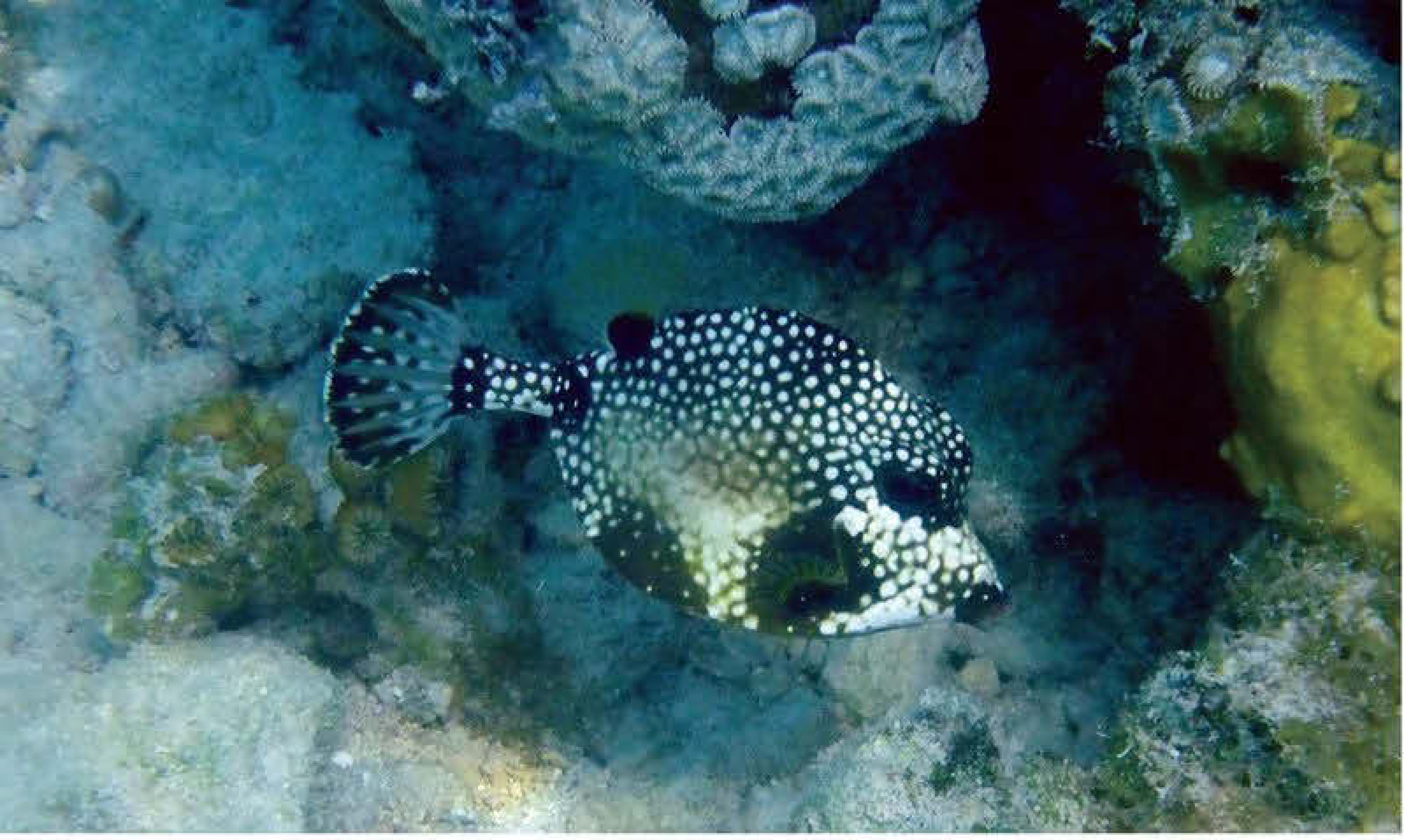
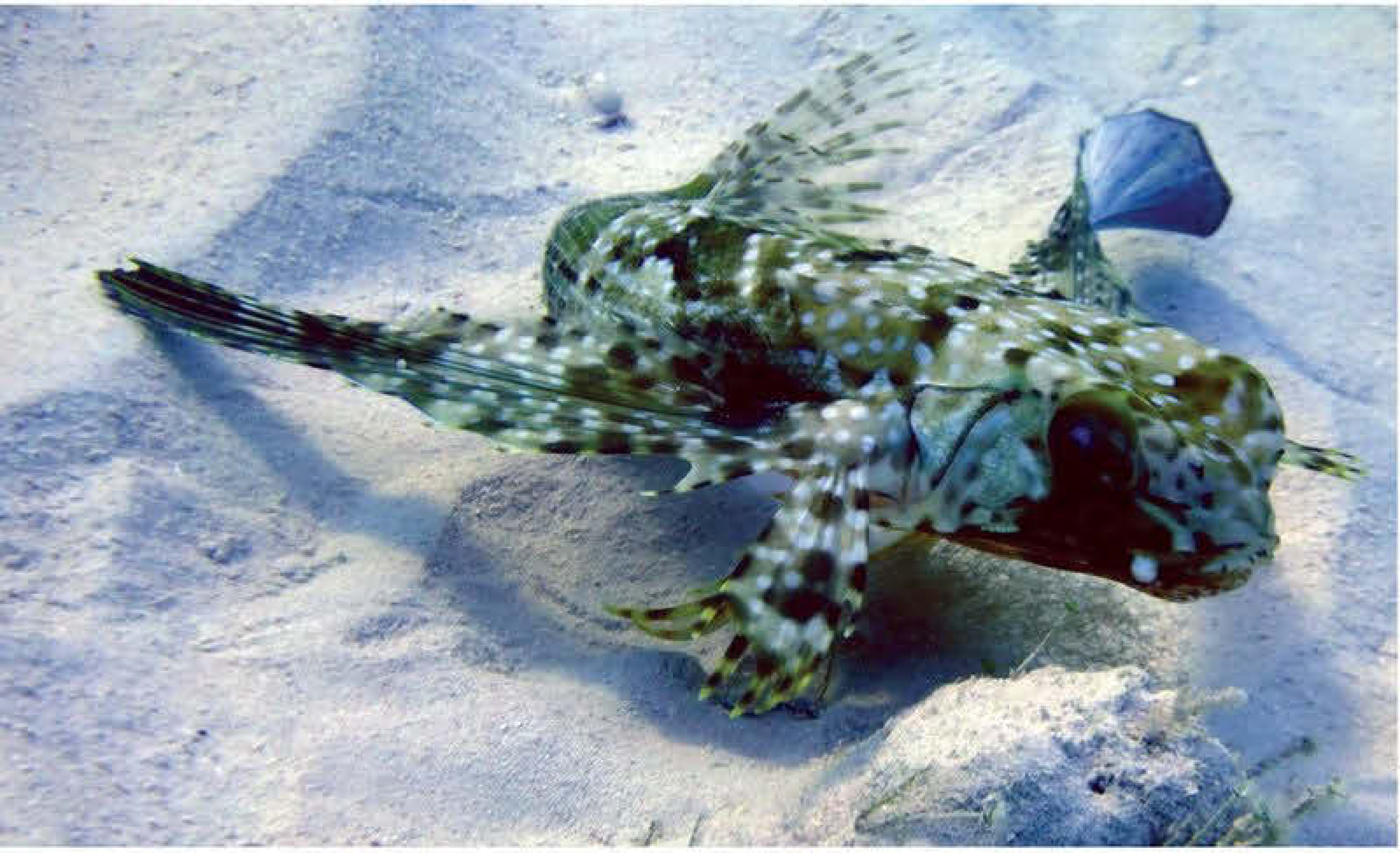


John Robertson

■ Spotted trunkfish (*Lactophrys bicaudalis*).



John Robertson

■ A flying gurnard (*Dactylopterus volitans*) walks across the sandy bottom off Guardalavaca.

Guardalavaca

The nearby resort of Guardalavaca offers another stunning white beach. A local dive master advised me to swim out 100 yards (91 meters) from one end of the beach. I crossed an area of sand, a large tract of sea grass, and a patch reef before I spotted several snorkelers.

The swim was well worth the effort. Despite being so far from the shore, the water was only 6 to 8 feet (2 to 2.5 meters) deep, and I was greeted by an amazing landscape of *Acropora* hulks, great skeletons spreading out like trees and encrusted with forests of sea fans. Visibility here was excellent, but these incredible structures were so large that the channels between them felt like alleyways between small buildings.

All the fishes I had seen at Playa Pesquero were here, too, as well as a few other species. A beautiful trunkfish (*Lactophrys bicaudalis*) was trying hard to evade the attention of a young remora that eventually gave up and tried to attach to my leg. A smaller species of trunkfish, adorned with exquisite spots, also hovered nearby.

Over the Sand

In total, my snorkeling allowed me to observe almost 90 species of fish in these various habitats of coral, rock, and deeper reef. In comparison, the sandy areas that divide up the structured locations can appear quiet and sterile—yet these areas too are worth a look.

One morning, I entered the water as the sun crept above the horizon. The conditions were calm as I made my way parallel to the beach, approximately 30 yards (27.5 meters) out over a sandy plain of perfect clarity.

A lonely tulip shell snail left its track in the soft substrate. Peacock soles blended into sand and rocky areas, changing color as swiftly as do squid. A group of bonefish were digging greedily for invertebrates such as white crabs and bristleworms, while in the distance, a trio of huge barracuda and a languid snapper warily moved away as I approached.

The Flying Gurnard

At that moment, I noticed the strangest-looking fish I've ever seen. It was a flying gurnard (*Dactylopterus volitans*), picking its way over the sand like a giant insect. It measured approximately a foot (30.5 cm) long, and despite having huge eyes, it appeared quite unconcerned that I was swimming down to take pictures of it.

The flying gurnard has amazing fins. Creeping as slowly as a tortoise over the sandy bottom, it literally walks, raising up on its ventral fins and forming a tripod with its tail as a stabilizer. Its large pectoral fins are in two sections that operate independently. The front part acts as a hand to scoop sand up to its mouth, rather than lowering its head. The back part spreads like enormous wings when the fish is disturbed. These huge fins serve merely to shock and deter predators.

The fish has a very stiff, ungainly appearance, with an armored head and bony plates on its body. It also has long spines rising from the back of the head, on both sides, and from the gill covers. I am not surprised that scientists cannot agree on where these amazing fish fit in the scheme of things. FishBase places the gurnards as a separate family, Dactylopteridae, within the Scorpaeniformes.

An Excellent Destination

I went to Cuba looking for something different, and it certainly did not disappoint. This is a poor country, but the people were very friendly, our hotel was good, and the Caribbean music was wonderful. The beautiful beach of Playa Pesquero provides an excellent location for sunbathing, swimming, salsa lessons, and snorkeling.

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Richard Aspinall

Coral frags are increasingly being used to create healthy and thriving coral reefs.

A Guide to Fragging, Part 3: SPS Corals

Richard Aspinall

Richard Aspinall

Many of these corals from a shallow reef in Fiji measure several feet across, making them unlikely inhabitants for the average reef tank.

I'm fortunate enough to spend several weeks a year photographing and diving on some pretty stunning coral reefs in the wild. It's due to my time diving and photographing beautiful coral reefs that I have noticed just how different reefs in the wild are from their captive counterparts.

It's not surprising that, despite our best efforts, we cannot replicate the vast scale of the average coral reef. We also tend to put far more individual organisms and colonies into a smaller amount of space in captivity than would be found in the same volume in the wild.

I am reminded of this regularly when I see a patch of reef that is dominated by one particular species of coral, be it a stand of elkhorn coral in the Caribbean, cabbage coral in the South Pacific, or a tabulate form of *Acropora* in the Red Sea; you often find vast areas of coral that are all derived from the same origin. How and why does this happen?

Wild Propagation

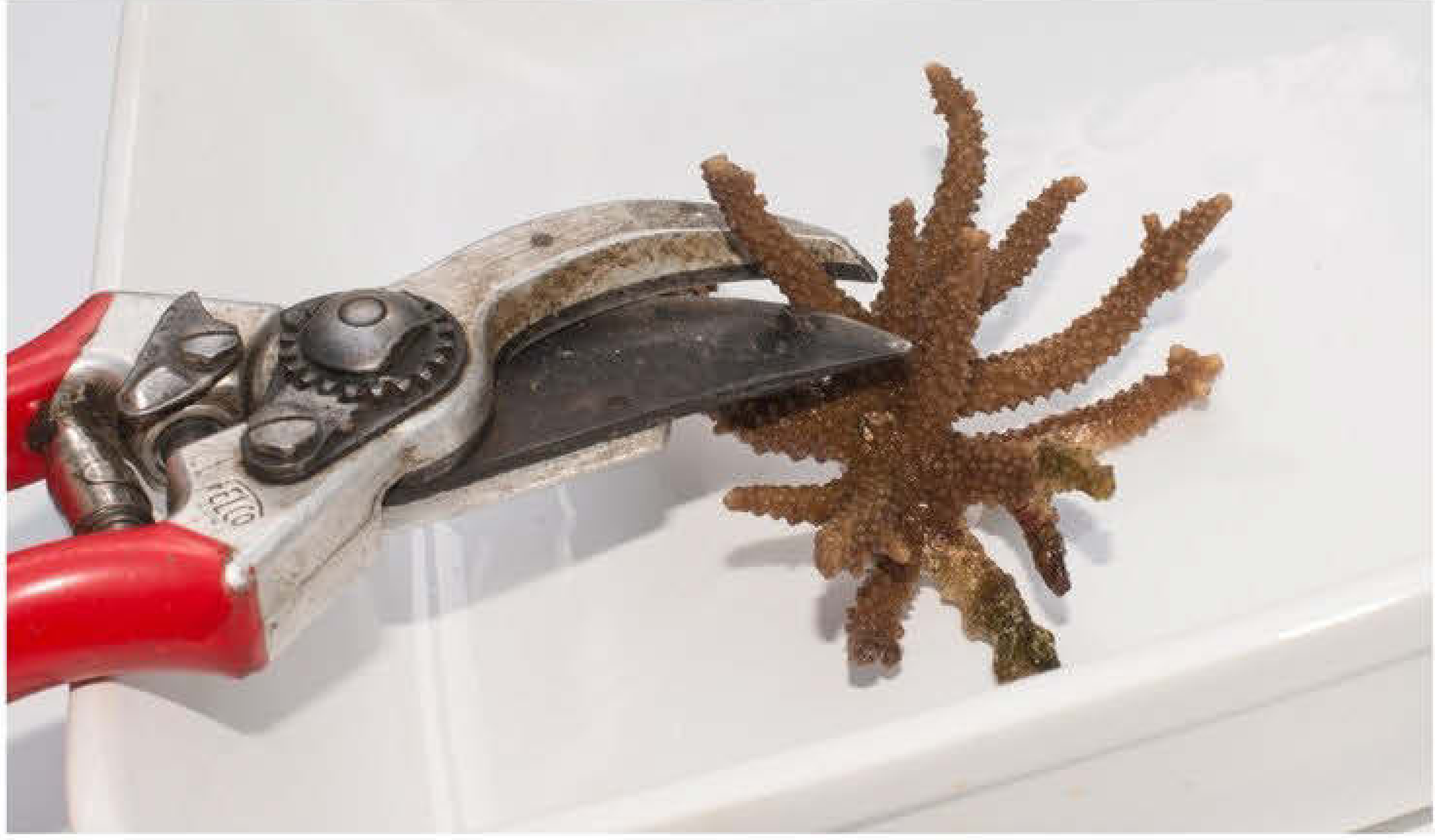
Well, hard corals are...hard, but they are

Richard Aspinall

A small piece of *Seriatopora* spreads across its attachment point in the author's tank.

Richard Aspinall

■ The author selected this piece of *Acropora* coral from his sump for fragging.


Richard Aspinall

■ A pair of garden clippers makes an ideal tool for fragging SPS corals.

Richard Aspinall

■ An example of a precision cut that creates minimal damage to the frag.

also brittle. While they can resist a great deal of pressure from the flow of water in areas of high current, they are still quite delicate.

In essence, corals made up of structures that are plate forming, shaped like a table, or antler- or finger-like are easily damaged, with pieces that can easily snap off. If the resultant frag fetches up in a suitable location where its current and light requirements are met, the frag will grow, attach, and form a new colony.

What this means in the wild is that as coral reefs form and grow, they are also falling apart. Thus, over the course of many centuries, they are on the move, marching into the open sea. The reasons for the fracture of the individual coral colonies are varied but can include storms, large grazing fish, careless turtles, divers, and simple mechanical failure due to gravity. In some instances, wave action and storm surges will throw broken pieces of coral onto the reef plate, into lagoon structures, and back onto the reef crest close to their point of origin, allowing the cycle to begin again.

Fragging SPS Corals, Step by Step

Although I'm going to use a small polyped stony (SPS) coral for this article, this methodology of fragging can be used for any piece of coral that can be snapped from its mother colony (a Duncan coral, for example) or organisms such as gorgonians. However, encrusting corals are a slightly different challenge and require more physical separation with the use of hobby saws.

STEP 1

I'm going to select a large frag that's been in my sump for quite some time. It has not grown particularly well, and some tips have been damaged. It's an ugly old lump, but it will allow me to create several smaller pieces for attachment or trade that will develop more aesthetically pleasing growth forms.

At this point, I can check for other issues. Does the source coral look healthy? Is the tissue patchy or damaged? Are there any flatworms visible? If the coral is from your home system, then you'll have a clue as to its health, but if you've acquired some coral material from elsewhere, consider keeping it in an isolated quarantine system and/or using a proprietary coral dip. You don't

Richard Aspinall

Equal pieces of two-part epoxy putty are ready to be mixed to create the adhesive.

want to save a few dollars at the expense of destroying your display aquarium.

STEP 2

SPS fragging is quite straightforward, but you'll want to make life easier for yourself by setting up your work area for ease and reducing the stress on your source coral and frags.

I like to use a well-lit table with a chopping board and a basin or bowl that contains the source coral and some system water. A second bowl containing a frag rock is handy for depositing the new frags, but more on that in a moment. My tools and some towels round out the equipment I use for fragging SPS corals.

STEP 3

I've seen some nice coral propagation kits on the market in recent years, but SPS fragging can be achieved without any particular kit. You can simply snap the coral with your fingers, but you should avoid doing so if possible. If you have the source colony on your table, then snapping isn't too much of a big deal. However, problems could occur if the source colony is in a tank. You might break the coral at an unseen weak point, your hand may snag another coral, or the force of breaking a piece with your hands could be transferred down the coral skeleton, possibly resulting in the entire colony breaking away from the rockwork.

Bird's nest corals (*Seriatopora* sp.) are notorious for doing this. When corals are broken by hand, it's not uncommon for a flap of flesh to remain, slowly tearing flesh away from the entire colony.

It's a better idea to use some sort of tool. You can buy coral-fragging tools that have specially designed bypass blades that hold the coral with even pressure, which creates a precise amount of force onto the coral. These tools are ideal and very useful for branching forms.

I use an old pair of garden clippers that were made to prune roses—I always make sure they're thoroughly cleaned to remove any pollutants before using them. Hydrogen peroxide works well to clean fragging tools, ensuring that no bacteria is present, just be sure to rinse them well after using the hydrogen peroxide.

Another benefit these tools have over using your bare hands is that they cause minimal damage to the coral tissues around the break. If you hold a coral with your fingers to snap it, you ultimately place pressure onto the coral tissue, which causes unnecessary stress and acts as a potential site for infection. However, you might just have to accept some damage from fingers with corals like plating montiporas, but expect the corals to produce mucus.

STEP 4

Once everything is set up to your satisfaction, you can start cutting. In theory, very small pieces of coral can regenerate into new colonies, but they are hard to work with, easily lost, and more susceptible to overgrowth from algae. I like to snip off pieces that are approximately an inch or two in length or, in the case of plating forms, pretty much the size of the fragging disc.

Once you've cut off some nice growing tips that will bush out nicely as they grow,

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■ A standard ceramic frag plug.

you need to consider how you are going to attach them. You can simply attach them directly onto your rockwork and they'll grow happily, but if you plan to trade them or transfer them to another system, then you'll want to attach them to something.

Fragging discs are the obvious choice. They come in various sizes, are made from ceramic, and blend in nicely as they quickly become encrusted with marine life. You can use bits of live rock or even ceramic tile, but fragging discs are easily slotted into frag racks using their stem. The last thing you want is newly fragged corals getting knocked into a crevice or into another coral by a bumbling hermit crab or grazing fish.

You can use cyanoacrylate gel to attach the corals—this works well with gorgonians—but I think the best substance is two-part epoxy putty. This material is widely available in fish stores in standard or coralline algae-colored varieties. With two-part epoxy, you take two equal amounts of each putty and mix them together to create one amorphous, even-colored substance.

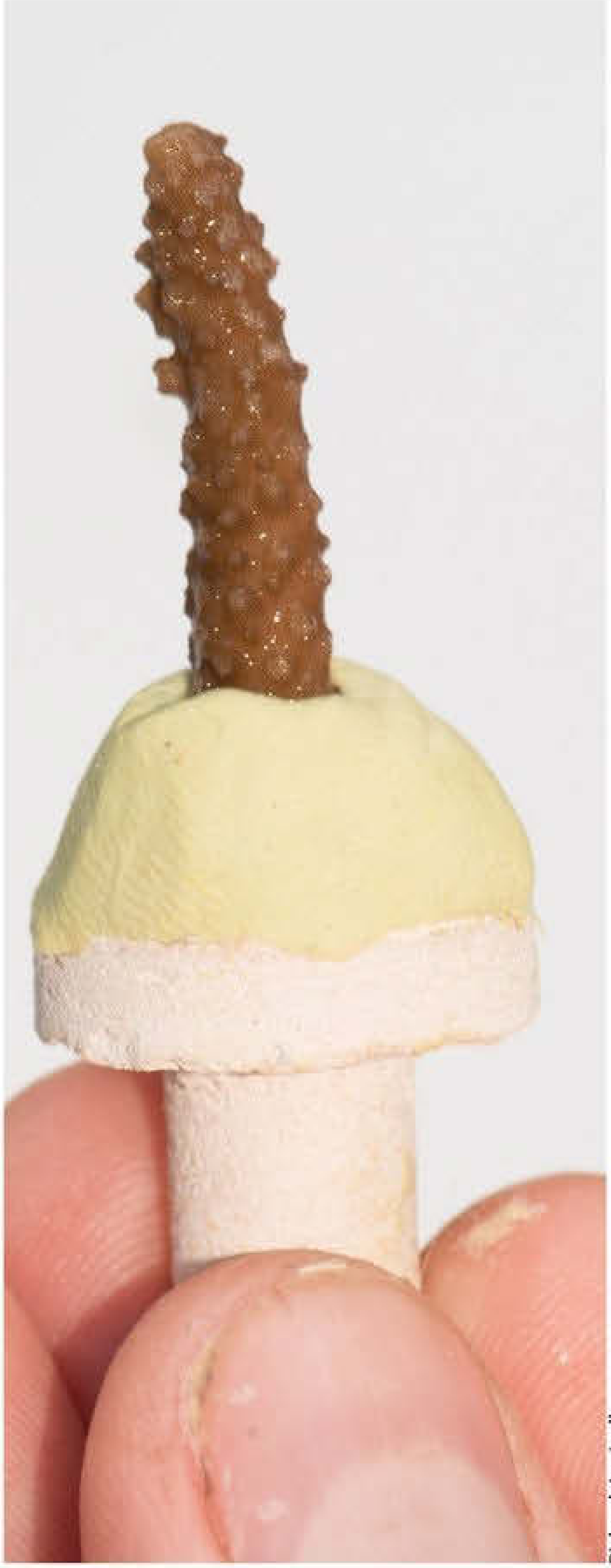
You can also use products designed for models and household repairs, which are often cheaper and available from the hardware store, although sometimes the products designed for aquarium use will set more quickly and won't liberate as many particles into the water.

Step 5

If you're using two-part epoxy, create the mixture. Once you have it prepared, break off one piece per coral frag, perhaps about half an inch (1.25 cm) in diameter, and stick it atop one of your fragging discs. It helps if the discs are dry and arranged in a rack on your work station.

It's a good idea to rinse your hands thoroughly—fresh water is fine. You will have a certain amount of the two-part epoxy on your fingers, which, although not toxic, will rub off onto the coral structures as you handle them. It will look unsightly and cause stress to the frag.

Dab away any excess moisture and mucus from the frag, then dip it into the epoxy. With dry hands, gather the epoxy up around the frag a little way with one finger to hold it. The epoxy isn't the stickiest stuff in the world and is not elastic, so you won't need to play with it too much. It will work well as long as it holds the coral in place and there is a good contact between the frag base and the epoxy.



Richard Aspinall

■ A coral frag is ready to be placed in the frag rack.

Step 6

Now you can transfer the new frags that are in the rack back into your system. Make sure as best you can that they're in similar conditions to the source coral. Keep them free from algae, and let them get on with recovering and growing. Setting times vary for the adhesive, but an hour or so is usually sufficient for the two-part epoxy.

Tidiness is in the eye of the beholder, but I believe that the coral should grow as long as it's held firmly and free from interference. After all, corals in the wild don't all end up sticking skyward at a 90-degree angle.

Growth

Depending on the coral, water quality, and light—as well as a variety of other factors—you should start to see some growth within a few weeks. Signs of growth often include a slight thickening of the frag just above the area of the epoxy.

Over time the coral will grow new tissue and skeletal material downward and across the fragging disc, although it should be noted that growth is aided by good lighting from a bright but diffuse source. I find that T5s or LEDs fitted with wide dispersion lenses work best.

You'll also notice the beginnings of new growth tips on your frag and, in the case of plating corals, they will do just that. It's at this point that you can feel really pleased with yourself and take pride in the fact that you are growing and propagating corals.

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aquarium society news

Kevin T. Adams
photographs by the author

Marine Aquarium Expo (MAX), April 18–19, 2015

Orange County Fair & Event Center, Costa Mesa, California

The Marine Aquarium Expo (MAX), presented by Sunset Promotional Services, Inc., is one of the leading, largest, and most innovative consumer trade shows in the aquatics industry. Now in its 8th year, MAX brings the saltwater aquarium industry and hobbyist community together for a weekend of fun, entertainment, and education with an impressive collection of over 100 exhibitors, workshops, speakers, and two hugely popular raffles.

MAX is an all-inclusive marine event where visitors will find a colorful array of fish/reef aquariums as well as peripheral goods and equipment. Presenters will include manufacturers, retailers, wholesalers, distributors, importers/exporters, and hobby sellers. Fish, corals, inverts, and frags of every kind will be available for trade and sale. Aquariums and aquarium accessories, illumination products, ornaments, heaters, aquarium furniture, fish food, and many other items will be available, all under one roof!

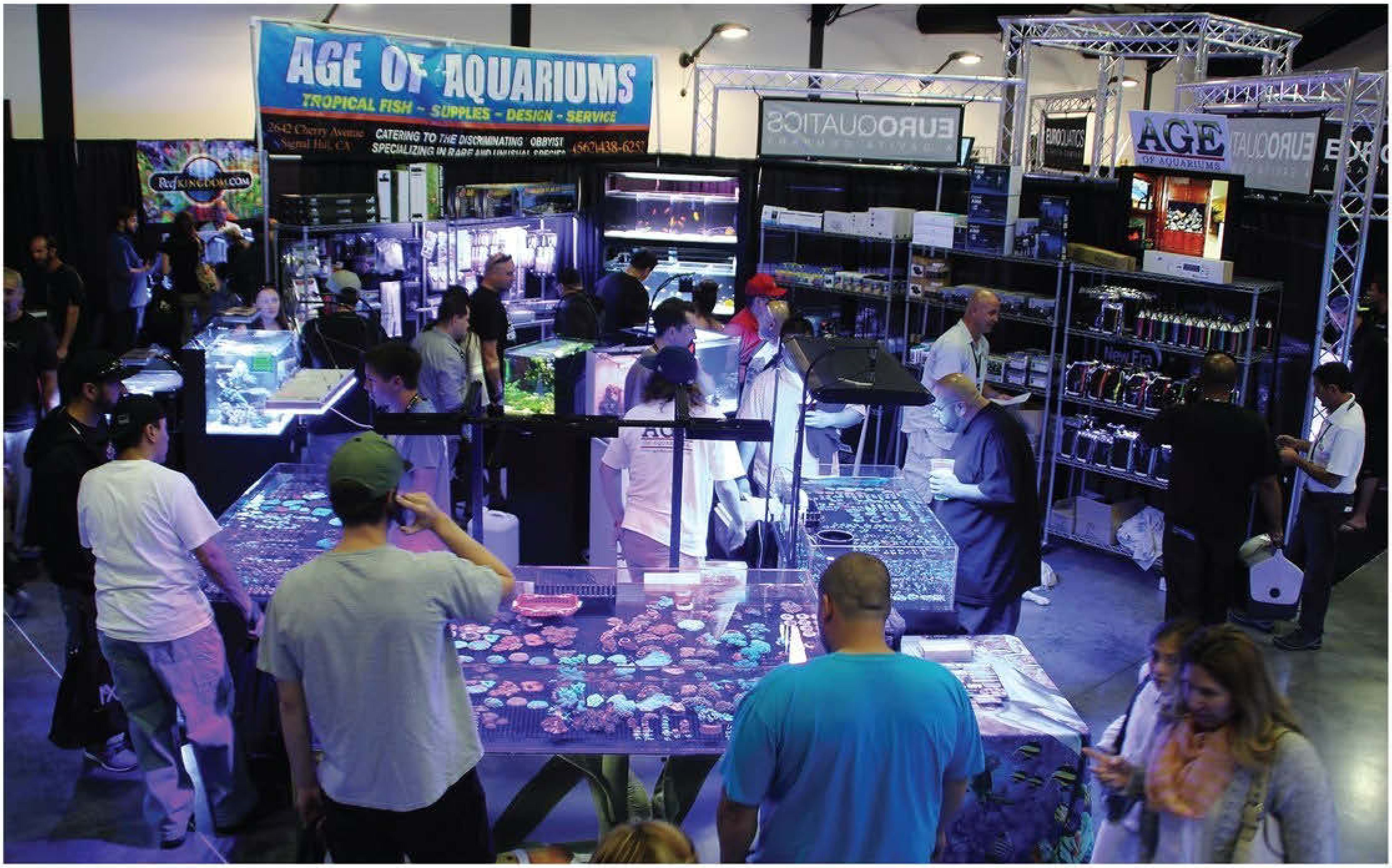
Touch Tank

MAX continually finds new and inventive ways to keep its attendees engaged. In 2009, MAX introduced an 8-foot touch tank containing an assortment of marine life for all guests to get an up-close-and-personal experience. Thanks to our sponsors, youngsters and adults can touch and learn about such amazing creatures as barbless stingrays, starfish, hermit crabs, snails, fire shrimp, horseshoe crabs, coral sponges, and more. In addition, guests can admire colorful tangs (powder blue, purple, and yellow tangs), angelfish, ornamental fish, anthias, royal grammas, and more.

Future Hobbyists

The MAX mission is to educate, communicate, and concentrate on the next generation. Many young guests who attend MAX are our future ecologists, marine biologists, oceanographers, and more. Volunteers for the 4-H Club attend MAX to share their understanding of marine life and its delicate ecosystem with expo guests.

At the “MAX FinZone,” an educational exhibit full of family-fun activities, young visitors can learn how to walk the plank from Captain Jack the pirate or watch in amazement as Steve the Balloon Guy turns an ordinary balloon into fun marine characters like an octopus, starfish, or even Nemo. Youngsters also can meet the magical MAX mermaids and enjoy arts and crafts, coloring books, and face-painting opportunities.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■ MAX showgoers examine the impressive collection of coral displays.

The 8-foot touch tank gives children a hands-on introduction to marine life.

Contests for Youngsters

Introduced in 2012, MAX holds its "Paper Airplane Toss" contest, an extraordinary family-fun activity in which both parents and children can participate. Parents help their children create a paper airplane, color it, number it, and give it a name.

MAX hosts many other fun contests for parents and children, including a baseball-throwing contest and miniature golfing competition. For MAX 2015, plans are in the making for a "MAX Float Your Boat" contest, which will involve designing, decorating, and naming a paper boat that will be tested for buoyancy as it sails across a 10-foot-deep aquarium tank.

Movies and Lectures

The MAX HD Movie Theater, featuring surround sound and a 12-foot screen, was introduced in 2011. Marine life-related animated movies such as *Finding Nemo*, *The Reef*, and *The Little Mermaid* have lit up the screen every two hours on both days of the expo. The goal of the theater is to cater to younger guests, keeping them entertained as long as possible while allowing hobbyist parents to enjoy the expo.

One of the most popular activities for hobbyists at MAX is the opportunity to listen to informative lectures from distinguished speakers, including Bob Fenner, Mark Callahan, Tullio Dell Aquila, Les Wilson, and Ariel Freudenthal. These are among the many recognized and respected speakers that will be at MAX 2015. All lectures are included in the admission price and are available to all guests. Past lectures have included "How to build a tank," "What type of lighting is best for your tank," and "How to move a 400-gallon tank across the country."

A MAX mermaid gives a high five to a youngster at the miniature golf competition.

Steve the Balloon Guy and Captain Jack the pirate entertain young guests at MAX.

Opportunity Drawing

The annual "MAX Opportunity Drawing" is the most anticipated and exciting event at MAX. Every hobbyist comes to MAX with a long wish list, hoping to win one of the wonderful and generous prizes donated by MAX exhibitors. Prizes worth hundreds and even thousands of dollars go home with lucky winners every year. MAX continues its annual drawing thanks to the generous donations from exhibitors such as Reef Brite, Red Sea, CaribSea, Seachem, Hydor, Rod's Reef, Kordon, Chemipure, Dr. Tim, and many more.

This year's grand prizes (one for each day of the two-day expo) come from Reef Brite and Red Sea. Reef Brite has donated a 6-foot XHO LED light fixture (retailing at $2600), while Red Sea has donated the Red Sea MAX C-250, a complete aquarium system (retailing at $2400).

Visit www.marineaquariumexpo.com for more details on the event schedule, directions, exhibitors, speakers, raffle items, and hotel accommodations.

meeting place

events

March 27–29 • Chantilly, Virginia

Super Pet Expo will feature The Aquarium Experience, adoptable pets, and more than 150 local and national exhibitors. Leashed pets are welcome. Join the Super Pet Expo team and NOVADog Magazine in an attempt to set a record for the largest "Doggie Kiss." For more information, visit **www.superpetexpo.com/chantilly.**

April 18–19 • Costa Mesa, California

The Marine Aquarium Expo (MAX) is the largest marine aquarium event in North America. Now in its 8th year, MAX will feature a colorful array of fish/reef aquariums and peripheral goods and equipment, corals, inverts, and frags for display, trade, and sale. For more details, visit **www.marineaquariumexpo.com.**

June 6–7 • Livonia, Michigan

The Michigan Guppy Breeders presents an IFGA-sanctioned guppy show and auction at the Quality Inn & Suites, 30375 Plymouth Road. Entries and judging for the show will take place on Saturday with an auction open to the public on Sunday morning. For more information, **visit www.ifga.org**.

clubs

REGIONAL

American Cichlid Association

Come join in the largest and most distinguished national organization of the cichlid hobby! Your membership in the American Cichlid Association (ACA) entitles you to six issues per year of our highly acclaimed Buntbarsche Bulletin and access to our online Trading Post, and each July the ACA hosts a fabulous convention not to be missed! Your membership in the ACA will offer so much more, such as participation in the Paul V. Loiselle Conservation Fund, cichlid research through the Guy D. Jordan Endowment Fund, hands-on cichlid conservation through ACA C.A.R.E.S., a speaker program, a Club Liaison Program, special awards, and an up-to-date, informative ACA website at **www.cichlid.org**

American Killifish Association

The American Killifish Association (AKA) is dedicated to the propagation, study, and conservation of killifish. Enjoy the benefits as a member. Membership is $26 per year and includes six issues of the Journal of the American Killifish Association and monthly issues of the Business Newsletter, which gives members the opportunity to obtain and sell killifish. Members are also given access to the members-only section of the website. The AKA hosts many events during the year, including the big Memorial Day Weekend convention and affiliate club shows, which occur all year long. Log on to **www.aka.org** for more information.

American Livebearer Association

The American Livebearer Association (ALA) offers bi-monthly publications, species maintenance programs, access to various types of livebearers, an annual convention, special publications, slides, and more. For more information, visit **www.livebearers.org**

The Angelfish Society

The Angelfish Society (TAS) is a collection of angelfish enthusiasts, hobbyists, and breeders who are interested in the advancement of our hobby through improvements in the quality of the fish we keep and breed by employing the standard which this society will develop. TAS is dedicated to the enhancement of the angelfish through high-quality breeding programs using standards established by the society. Informative online chatroom meeting schedules can be found at **www.theangelfishsociety.org.** Membership is $5 annually, which includes the quarterly FinTAStic newsletter.

Aquatic Gardeners Association

Membership in the Aquatic Gardeners Association includes a full-color quarterly journal with informative articles for beginners and advanced hobbyists alike. Dues are $20 per year (US, Canada, Mexico), $23 all other countries (multiyear discounts available). AGA also sponsors an annual online aquascaping contest and a biennial convention. For more information, visit **www.aquatic-gardeners.org**

The Canadian Association of Aquarium Clubs

The Canadian Association of Aquarium Clubs (CAOAC) is a non-profit association of aquarium, herptile, and pond clubs from across Canada and New York State. Some of the things we offer are: a national awards program to honor those in member clubs who have achieved success in breeding, plant propagation, or other endeavors related to the hobby; a Fish Rescue Program to help those hobbyists with large or unwanted fish to find new homes for them; and a chance to become involved with people who share similar interests. Please visit our website at **www.caoac.ca** for more information.

East Coast Aquarium Society

The East Coast Aquarium Society is the largest and fastest-growing aquarium club in Atlantic Canada. ECAS actively promotes and encourages aquatic education of freshwater and marine aquaria, aquatic plants, and other related livestock in a fun and informative learning environment. Benefits and privileges of joining include discounts from sponsors and local vendors, auctions and fish shows, and shopping nights at local fish stores. Members also join programs such as the Breeders Award Program (BAP) and the Horticulturalist Award Program (HAP), which offer hobbyists rewards for species breeding and plant propagation. Also held are monthly socials and chat nights. For more information, visit **www.eastcoastaquariumsociety.ca**

East Coast Cichlids

East Coast Cichlids is an active and friendly group of hobbyists who support each other in the breeding, raising, and care of all fish (not just cichlids). Fun, monthly events are held and online support is always available. Come see what the "buzz" is about! FREE membership! Join us for fish, fun, and friendship! **www.eastcoastcichlids.org**

Great Lakes Cichlid Society

Join one of the Midwest's top cichlid clubs now celebrating its 20th year in progress. Members come from all states surrounding the Great Lakes area and throughout the nation. The club meets on the fourth Friday of every month, excluding July, 8 p.m. at the Masters Church (771 east 260th St. Euclid, Ohio, 10 minutes east of downtown Cleveland). There are local and national speakers monthly, raffles, breeder award programs, refreshments, and great fish talk. For more information visit **www.GreatLakesCichlidSociety.net**

International Betta Congress

Founded in 1966, the International Betta Congress (IBC) is a nonprofit worldwide organization promoting the breeding, raising, and study of bettas. IBC actively promotes the selective breeding of various color and finnage strains of bettas through the Sanctioned Show program, where fish are exhibited and judged in pre-defined classes. Our bi-monthly bulletin FLARE! contains articles written by our members and is geared toward the beginner as well as the advanced hobbyist. We have a June Annual Convention hosted by one or more IBC chapters (smaller local groups of betta hobbyists within IBC). As a member of IBC you can join our members-only forum, a free service where you can send and receive group messages, share photos, access IBC-related files, and much more. For further information visit the IBC official website, **www.ibcbettas.org**

International Fancy Guppy Association

The International Fancy Guppy Association (IFGA) is an organization for guppy breeders and hobbyists interested in breeding and showing fancy guppies. A monthly publication is available and many shows with over 40 color/tail-shape classes are held throughout the country yearly. For more information visit **www.ifga.org**

Mid-Atlantic Cichlid Keepers

The Mid-Atlantic Cichlid Keepers (M.A.C.K.) is a group of amateur aquarists whose main interest is the breeding, raising, and management of cichlids. Monthly meetings are held from September to May on the 3rd Friday of each month, at 8 p.m. (doors open at 7:30 p.m.), in the Springfield Town Hall building, 50 Powell Road Springfield, PA 19064. For further information, email membership@mackattack.org or visit **www.mackattack.org**

Mid-Atlantic Koi Club

An active and friendly club for people who are interested in the study and enjoyment of koi, goldfish, and outdoor ponds. Monthly meetings provide a variety of activities, including lectures, pond tours and koi shows, as well as an opportunity to meet other enthusiasts. For information email members@makc.com or visit **www.makc.com**

The Midwest Cichlid Association

The Midwest Cichlid Association (MCA) is a new and exciting organization, dedicated to the promotion of keeping, breeding, and specialization of the cichlid fish hobby. We eat, sleep, and breathe cichlids! If you would like more information about The Midwest Cichlid Association, please email us at Contact@MidwestCichlid.com or visit **www.midwestcichlid.com**

North American Discus Association

The North American Discus Association (NADA) is a non-profit organization of discus enthusiasts, hobbyists, and breeders. Our goal is to educate the general public, encourage new members, provide information on the hobby, and promote discus at fish shows. We offer a quarterly newsletter. Please visit our website at **www.discusnada.org** for more information.

The North American Native Fishes Association

The North American Native Fishes Association (NANFA) is a not-for-profit, tax-exempt corporation dedicated to the appreciation, study, and conservation of the continent's native fishes. The organization seeks to increase and disseminate knowledge about North America's native fishes and their habitats, and to promote the conservation of native fishes and the protection/restoration of natural habitats. It also looks to advance the captive husbandry of North America's native fishes for the educational, scientific, and conservation benefits it affords. For more information, visit **www.nanfa.org**

Northeast Council of Aquarium Societies

The Northeast Council of Aquarium Societies is a group of aquarium societies in the northeast, where we share information about running an aquarium society and generally bring all members of each of our clubs together. The NEC sponsors an annual general tropical fish convention in March or April each year. **www.northeastcouncil.org/nec/**

Northwest Killies Club

The Northwest Killies Club (NWK) is an affiliate club of the American Killifish Association. Our intent is to represent the interests of killifish keepers of the Pacific Northwest and beyond. Membership is open to all. Our members are widely scattered, living in various parts of Oregon, Washington, and as far away as Utah. For that reason, we call ourselves a "virtual club," using e-mail to keep in regular contact and meeting physically only four times a year. We also publish a quarterly newsletter. For more information, visit **http://nwk.aka.org**

The Pacific Coast Cichlid Association

Now celebrating its 20th year, the Pacific Coast Cichlid Association (PCCA) meets in San Jose, CA the second Saturday of each month. Meetings feature a presentation (past speakers have included Dr. Paul V. Loiselle and Ad Konings) with an auction and raffle following. For more information, write to: PCCA P.O. Box 28145t, San Jose, CA 95159-8145 or visit **www.cichlidworld.com**

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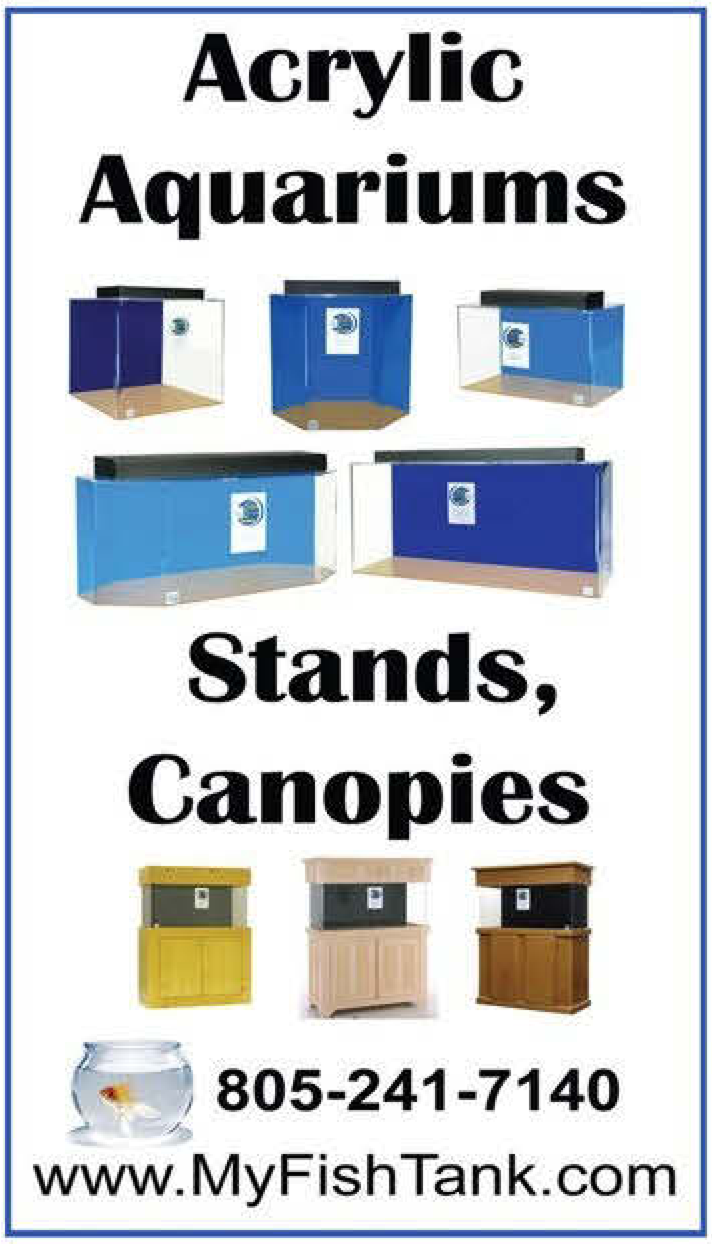

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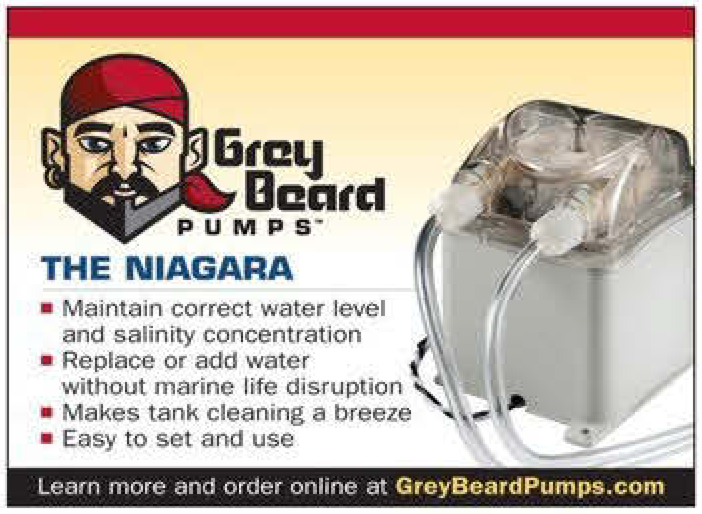

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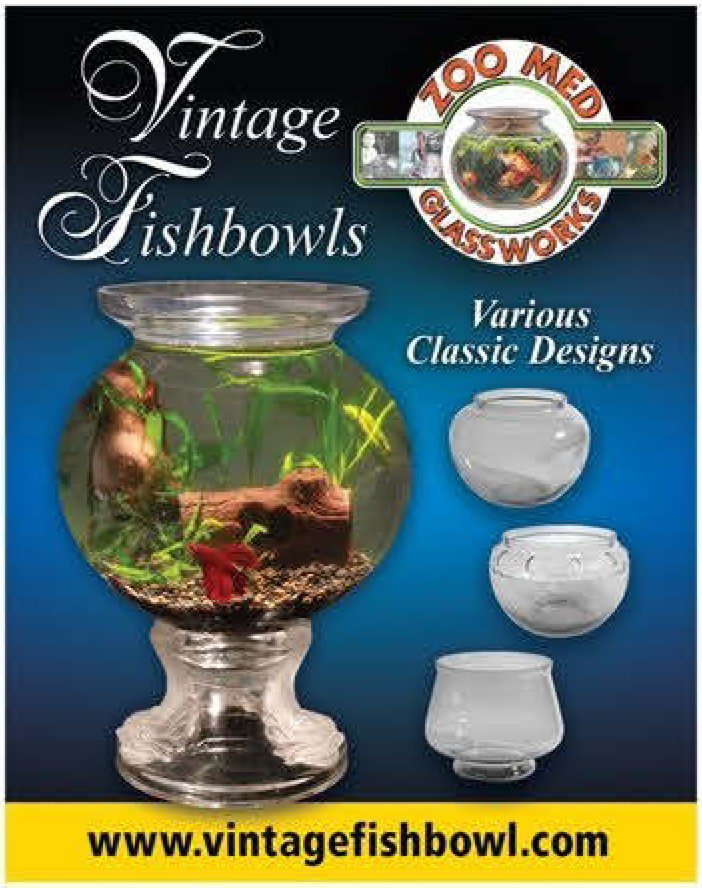

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Product Spotlight

Circulation Pump

Hydor has specialized in design and production of high-tech aquarium products since 1984, and is continuing that tradition of innovation by introducing the newly designed Koralia Third Generation circulation pump line for aquariums. It includes a patented dual magnetic support system, enhanced vibration absorbing silicone for silent operation, innovative technology that maximizes energy efficiency, and a revolutionary design that allows the pump to pivot in virtually any direction. It's compatible with timers and controllers, which helps to create a natural current for a healthy aquarium. A flow diffuser, small fish guard, and medium fish guard are included for added customization. www.hydor.com

Jellyfish Tank

Jellyfish Art announces the new Jellyflap jellyfish aquarium. The German-designed aquarium is a self-contained, 2-gallon system complete with multi-stage integrated filtration and color-changing LED lighting. The Jellyflap comes complete with everything needed to create a healthy jellyfish aquarium, including sea salt mix and a redeemable voucher for cultured jellyfish that are delivered right to your door from Jellyfish Art. www.jellyfishart.com

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Submissions: *Tropical Fish Hobbyist* • Product Spotlight • One TFH Plaza, Third and Union Aves. • Neptune City, New Jersey 07753
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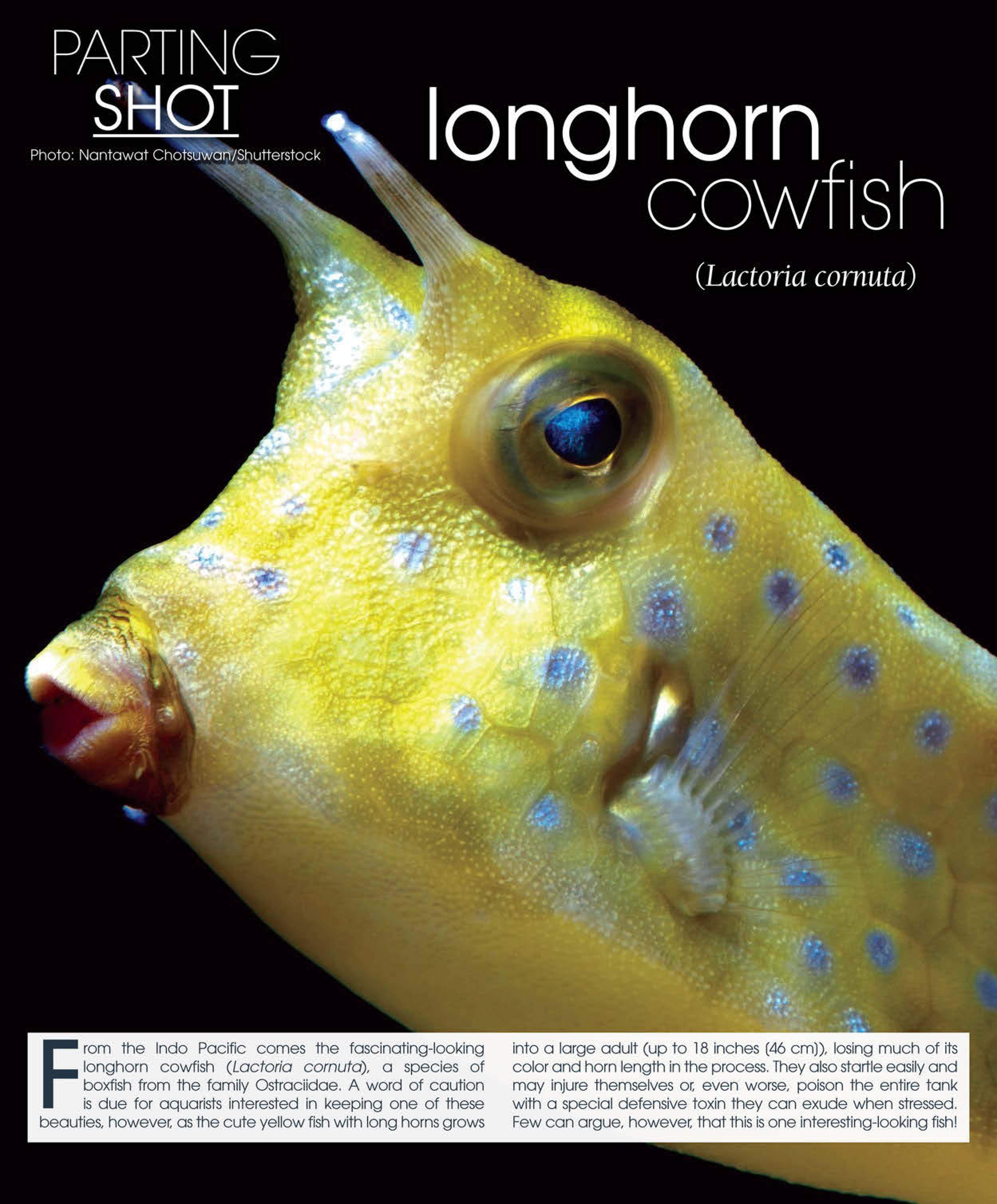

Photo: Nantawat Chotsuwan/Shutterstock

longhorn cowfish

(Lactoria cornuta)

From the Indo Pacific comes the fascinating-looking longhorn cowfish (*Lactoria cornuta*), a species of boxfish from the family Ostraciidae. A word of caution is due for aquarists interested in keeping one of these beauties, however, as the cute yellow fish with long horns grows into a large adult (up to 18 inches (46 cm)), losing much of its color and horn length in the process. They also startle easily and may injure themselves or, even worse, poison the entire tank with a special defensive toxin they can exude when stressed. Few can argue, however, that this is one interesting-looking fish!

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